



GAS TURBINE / JET ENGINE

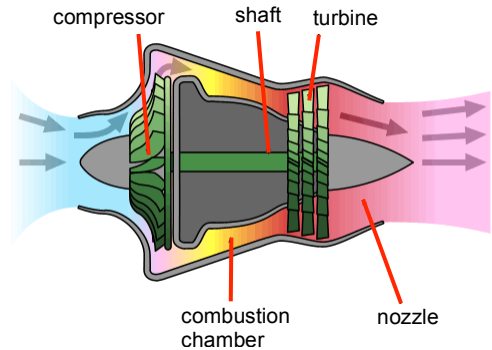
STEM

A **gas turbine** (or jet engine) is a machine that converts energy-rich, **liquid fuel** into a powerful pushing force called **thrust**. Five small gas turbine engines provide enough thrust to allow Gravity Jet Suit pilots to fly and manoeuvre in the air.

A jet engine uses the same scientific principle as a car engine: it burns fuel with air in a **chemical reaction** called **combustion**. This releases **energy**. A gas turbine is designed to Hoover up huge amounts of air and burn it with vast amounts of fuel (roughly 50 parts air to 1 part fuel), so the main reason why it makes more power than a car engine is because it can **burn more fuel**.

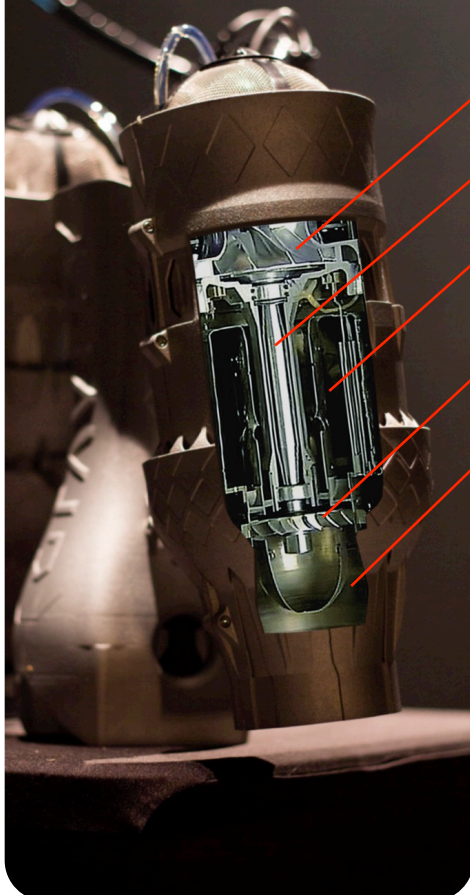
Because intake, compression, combustion, and exhaust all happen simultaneously, a jet engine can produce maximum power all the time. However, this is bad for mechanical reliability of the engine.

- The blades of the compressor spin at high speed and compress or squeeze the air.
- The compressed air is then sprayed with fuel and an electric spark lights the mixture in the combustion chamber.
- The burning gases expand and blast out through the nozzle at the back of the engine.
- **As the jet of gas shoots backward, the engine is thrust forward.**



Boyle's Law Boyle says Pressure x Volume is proportional to Temperature ($PV = RT$). As the temperature rises rapidly in the combustion chamber, (typically to over 1000°C) the volume of the gases flowing through the engine increases, both with the chemical reaction of the combustion of fuel, but also due to the temperature rise, producing a big increase in the flow of hot gases. The pressure of the gases then drops rapidly in passing through the turbine blades, dropping the exhaust temperature (to around 500°C).

Inside the Gravity Jet Suit engines



- compressor
- shaft
- combustion chamber
- turbine
- nozzle



Each main part of the engine does a different thing to the air or fuel mixture passing through:

- **Compressor:** Dramatically increases the pressure of the air (and, to a lesser extent) its temperature.
- **Combustion chamber:** Dramatically increases the temperature of the air-fuel mixture by releasing heat energy from the fuel.
- **Shaft:** An axle that runs the length of the engine and connects the **turbine** blades to the compressor fan. So, as the turbine blades spin, they also turn the compressor fan sucking more air into the engine
- **Exhaust nozzle:** Dramatically increases the velocity of the exhaust gases, they also allow the Gravity Jet Suit pilot to accurately adjust thrust vectors to manoeuvre during flight.

