We discussed last time how Brayton Cycles can have an extremely high power to weight ratio. These characteristics make Brayton Cycles ideally suited for propulsion. We've already analyzed the Model 304 & Goblin II turbojet engines. Figure 9-48 p. 527. A turbojet is a Brayton cycle with a nozzle and a diffuser at the inlet & exit.

The Model 304 & Goblin II turbojets are slightly different from the jet engines you've probably seen on aircraft. p. 525 fig. 9-52 Commercial aircraft are typically driven by turbofan engines. Turbofans have a huge inlet fan that pulls in a large amount of air.

\[ F_{\text{thrust}} = m (v_{\text{out}} - v_{\text{in}}) \]

they can achieve similar thrust to turbojets simply by processing more air with a smaller BSIs. The fan air also helps to significantly reduce engine noise.

Increasing the bypass air even more requires removal of the cowling & a turboprop results. Figure 9-57 pg. 526.

Finally, we have Ramjets & Rockets!
It's easy enough to imagine how the fuel for these cycles is stored — jet fuel. How would we store energy for longer-term, like say for a spacecraft? Voyager 1 was launched in 1977 & has passed Pluto but is still working. How is this possible?

Words: Radio isotope thermoelectric generators (RTGs)

Show TG. You realize now that whenever you have a gradient, like in temperature for instance, you have an opportunity to produce useful work. Thermoelectric generators operate on the Seebeck effect. Whenever a temperature gradient is imposed on a dissimilar metal junction, a voltage is created. For should you, if you have a heat source in space, like Plutonium-238 with a half-life of 87 years, you can power a spacecraft for a long time. The problem? RTG's have a very low efficiency 3–7%.

So we need a light weight, higher efficiency alternative: Brayton cycle.

Show problem.