Jet propulsion

Name: Instructor: Course: Date: Jet propulsion The Brayton Cycle: Brayton-type engines comprise of three main components: the gas compressor, the mixing chamber and the expander. The Brayton works by drawing in ambient air into the compressor where it is compressed. The compressed air then goes through a mixing chamber and fuel is injected in an isobaric process.

The compression also creates heat and the combination of the heat, air and fuel is ignited in a cylinder that results in production of energy. This energy causes the heated air to expand through the piston in an isentropic process. Some of the energy produced also moves other crankshaft arrangements. Thus, the four major processes in an actual Brayton cycle include two adiabatic and isobaric processes. (Qin et al 39). The Ramjet cycle: Ramjets apply the Brayton technology.

In a ramjet cycle, the fuel is mixed with the compressed air and as it mixes, it disperses and forms a mixture that is ignited at the flame front. Flame holders in the cylinder give the necessary turbulent circulation for maintaining a stable flame. The products of the combustion are then removed through a nozzle. It is assumed that fuel flow is negligible when compared to the air volume (Lenoble & Ogaji 18). In that case, the Mach number for the input flow and the exhaust flow will be the same. The Turbojet cycle: Turbojets comprise of air compressors, combustion chambers, air inlets and gas turbines (Cumpsty 23). The compressor is powered by the turbine at a high speed to increase the energy of the airflow as well as compressing the air.

The combustion chamber has the role of stabilizing the flame by controlling the air-fuel intake. The hot air is directed rearwards to the end of the engine. The hot air passes through the turbines that have a high resistance to temperature into the nozzle. At this stage, the gas is converted to a high velocity spurt that thrusts the vehicle forward.

Turbojet performance can be increased by limiting the air and fuel flows. The Turbofan cycle: The operation of the engine has four main stages that have been labeled as “ Suck-Squeeze-Bang-Blow”. The air is sucked into the air intake and is compressed by an axial compressor to increase the temperature and pressure. The compressed air is then fed into the combustion chamber, mixed with kerosene and combusted that raises the temperature of the air. The hot, compressed air is passed through the turbines to convert the heat into mechanical energy. The mechanical energy is used to turn the compressor that finishes the engine cycle. This engine can be improved by adding an extra one or two shafts on the turbofan.

Since the fan has a larger diameter, the same tip speed is attained using a lower rpm making the two shafts useful. Most turbofans use multistage LP turbine to give out the same energy with smaller stage loads and lower tangential velocity (Sforza 89).