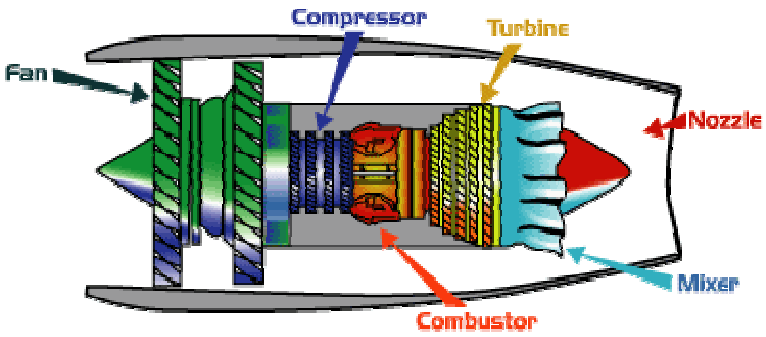
Jet engines move the airplane forward with a great force that is produced by a tremendous thrust and causes the plane to fly very fast.



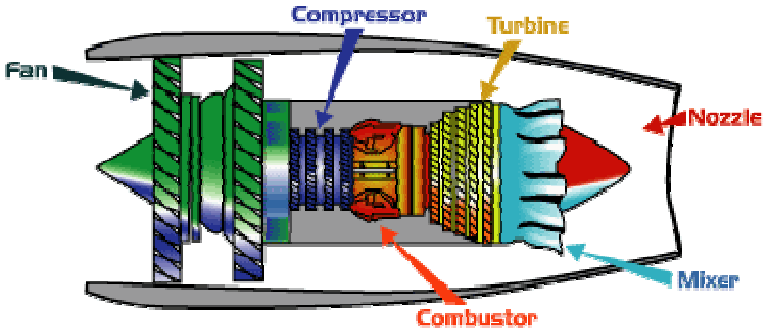
All jet engines, which are also called gas turbines, work on the same principle. The engine sucks air in at the front with a fan. A compressor raises the pressure of the air. The compressor is made up of fans with many blades and attached to a shaft. The blades compress the air. The compressed air is then sprayed with fuel and an electric spark lights the mixture. The burning gases expand and blast out through the nozzle, at the back of the engine. As the jets of gas shoot backward, the engine and the aircraft are thrust forward

The air goes through the core of the engine as well as around the core. This causes some of the air to be very hot and some to be cooler. The cooler air then mixes with the hot air at the engine exit area.

A jet engine operates on the application of Sir Isaac Newton's third law of physics: for every action there is an equal and opposite reaction. This is called thrust. This law is demonstrated in simple terms by releasing an inflated balloon and watching the escaping air propel the balloon in the opposite direction. In the basic turbojet engine, air enters the front intake and is compressed, then forced into combustion chambers where fuel is sprayed into it and the mixture is ignited. Gases which form expand rapidly and are exhausted through the rear of the combustion chambers. These gases exert equal force in all directions, providing forward thrust as they escape to the rear. As the gases leave the engine, they pass through a fan-like set of blades (turbine) which rotates the turbine shaft. This shaft, in turn, rotates the compressor, thereby bringing in a fresh supply of air through the intake. Engine thrust may be increased by the addition of an afterburner section in which extra fuel is sprayed into the exhausting gases which burn to give the added thrust. At approximately 400 mph, one pound of thrust equals one horsepower, but at higher speeds this ratio increases and a pound of thrust is greater than one horsepower. At speeds of less than 400 mph, this ratio decreases.

In a turboprop engine, the exhaust gases are also used to rotate a propeller attached to the turbine shaft for increased fuel economy at lower altitudes. A turbofan engine incorporates a fan to produce additional thrust, supplementing that created by the basic turbojet engine, for greater efficiency at high altitudes. The advantages of jet engines over piston engines include lighter weight with greater power, simpler construction and maintenance with fewer moving parts, and efficient operation with cheaper fuel.

Parts of a Jet Engine



Fan - The fan is the first component in a turbofan. The large spinning fan sucks in large quantities of air. Most blades of the fan are made of titanium. It then speeds this air up and splits it into two parts. One part continues through the "core" or center of the jet engine, where it is acted upon by the other jet engine components.

The second part "bypasses" the core of the jet engine. It goes through a duct that surrounds the core to the back of the jet engine where it produces much of the force that propels the airplane forward. This cooler air helps to quiet the jet engine as well as adding thrust to the jet engine.

Compressor - The compressor is the first component in the jet engine core. The compressor is made up of fans with many blades and attached to a shaft. The compressor squeezes the air that enters it into progressively smaller areas, resulting in an increase in the air pressure. This results in an increase in the energy potential of the air. The squashed air is forced into the combustion chamber.

Combustor - In the combustor the air is mixed with fuel and then ignited. There are as many as 20 nozzles to spray fuel into the airstream. The mixture of air and fuel catches fire. This provides a high temperature, high-energy airflow. The fuel burns with the oxygen in the compressed air, producing hot expanding gases. The inside of the combustor is often made of ceramic materials to provide a heat-resistant chamber. The heat can reach 2700°.

Turbine - The high-energy airflow coming out of the combustor goes into the turbine, causing the turbine blades to rotate. The turbines are linked by a shaft to turn the blades in the compressor and to spin the intake fan at the front. This rotation takes some energy from the high-energy flow that is used to drive the fan and the compressor. The gases produced in the combustion chamber move through the turbine and spin its blades. The turbines of the jet spin around thousands of times. They are fixed on shafts which have several sets of ball-bearing in between them.

Nozzle - The nozzle is the exhaust duct of the jet engine. This is the jet engine part which actually produces the thrust for the plane. The energy depleted airflow that passed the turbine, in addition to the colder air that bypassed the engine core, produces a force when exiting the nozzle that acts to propel the engine, and therefore the airplane, forward. The combination of the hot air and cold air are expelled and produce an exhaust, which causes a forward thrust. The nozzle may be preceded by a **mixer**, which combines the high temperature air coming from the jet engine core with the lower temperature air that was bypassed in the fan. The mixer helps to make the jet engine quieter.