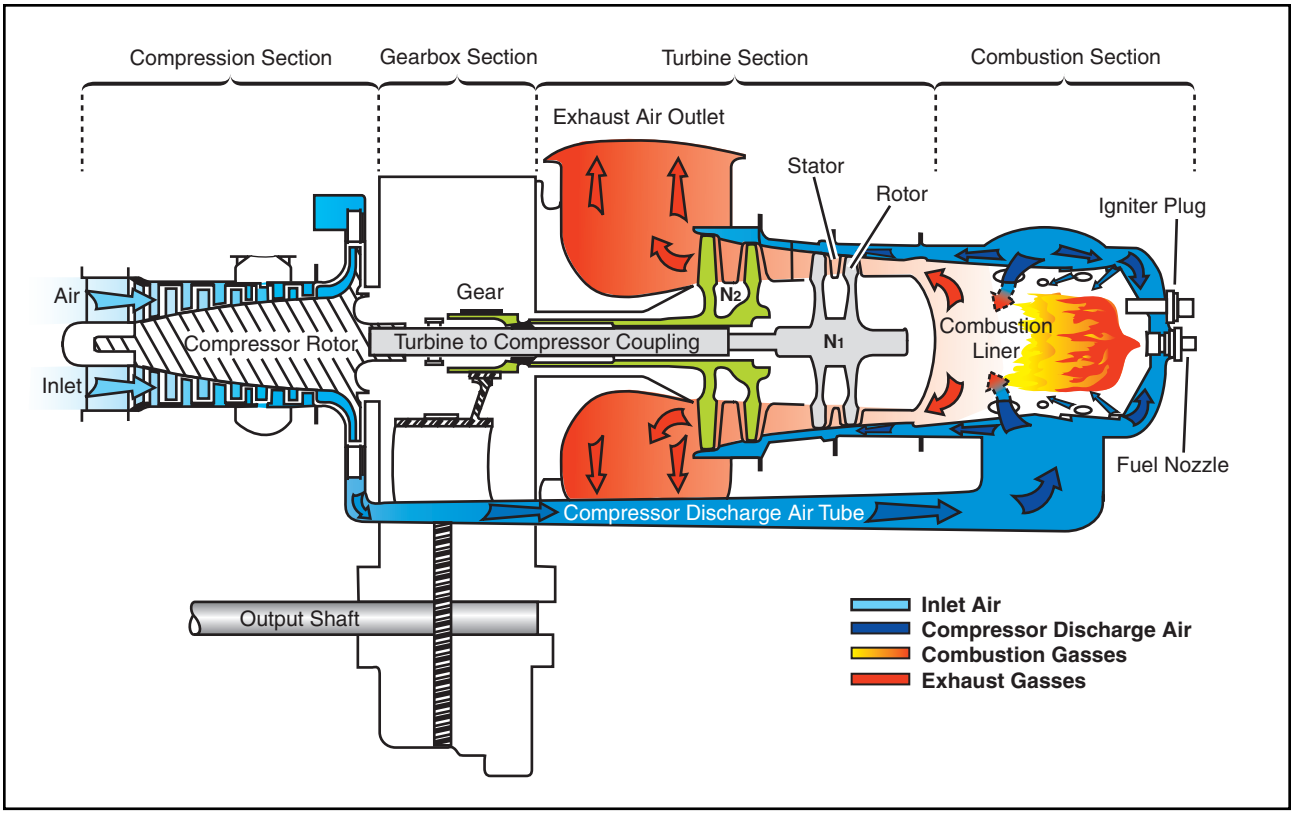

Figure 5-2. Many helicopters use a turboshaft engine to drive the main transmission and rotor systems. The main difference between a turboshaft and a turbojet engine is that most of the energy produced by the expanding gases is used to drive a turbine rather than producing thrust through the expulsion of exhaust gases.

combustion gas is finally expelled through an exhaust outlet. [Figure 5-2]

COMPRESSOR

The compressor may consist of an axial compressor, a centrifugal compressor, or both. An axial compressor consists of two main elements, the rotor and the stator. The rotor consists of a number of blades fixed on a rotating spindle and resembles a fan. As the rotor turns, air is drawn rearwards. Stator vanes are arranged in fixed rows between the rotor blades and act as a diffuser at each stage to decrease air velocity and increase air pressure. There may be a number of rows of rotor blades and stator vanes. Each row constitutes a pressure stage, and the number of stages depends on the amount of air and pressure rise required for the particular engine.

A centrifugal compressor consists of an impeller, diffuser, and a manifold. The impeller, which is a forged disc with integral blades, rotates at a high speed to draw air in and expel it at an accelerated rate. The air then passes through the diffuser which slows the air down. When the velocity of the air is slowed, static pressure increases, resulting in compressed, high-pressure air. The high pressure air then passes through the compressor manifold where it is distributed to the combustion chamber.

COMBUSTION CHAMBER

Unlike a piston engine, the combustion in a turbine engine is continuous. An igniter plug serves only to ignite the fuel/air mixture when starting the engine. Once the fuel/air mixture is ignited, it will continue to burn as long as the fuel/air mixture continues to be present. If there is an interruption of fuel, air, or both, combustion ceases. This is known as a “flame-out,” and the engine has to be restarted or re-lit. Some helicopters are equipped with auto-relight, which automatically activates the igniters to start combustion if the engine flames out.

TURBINE

The turbine section consists of a series of turbine wheels that are used to drive the compressor section and the rotor system. The first stage, which is usually referred to as the gas producer or N_1 may consist of one or more turbine wheels. This stage drives the components necessary to complete the turbine cycle making the engine self-sustaining. Common components driven by the N_1 stage are the compressor, oil pump, and fuel pump. The second stage, which may also consist of one or more wheels, is dedicated to driving the main rotor system and accessories from the engine gearbox. This is referred to as the power turbine (N_2 or N_r).