

23.1 Purpose and Operation

- The turbine is located immediately behind the combustion chamber. Its purpose is to extract
- kinetic and thermal energy from the high-velocity hot gas stream and convert it into
- mechanical energy to drive the compressors and the engine's accessory gearbox.
- ☐ Turbine Stage: A turbine stage consists of a set of stationary vanes called Nozzle Guide
- Vanes (NGVs) followed by a set of rotating blades called Turbine Blades.
- ☐ Operation: The NGVs are shaped to form convergent ducts that accelerate the hot gas and
- direct it onto the turbine blades at the optimum angle. The gas then strikes the turbine blades,
- causing them to rotate at high speed. As the gas does work on the turbine blades, its pressure,
- temperature, and velocity decrease.

22.2 Stresses and Blade Design

- ☐ Stresses: Turbine blades are subjected to immense stress from extreme temperatures and
- massive centrifugal forces. Over time, this combination causes the blades to stretch, a
- phenomenon known as creep. Blades have a finite life and must be replaced after a certain
- number of operating cycles.
- ☐ Blade Fixing: Turbine blades are commonly attached to the turbine disc using a fir-tree root
- fixing, which allows for thermal expansion while securely holding the blade against
- centrifugal forces.
- ☐ Blade Cooling: To withstand temperatures that are often higher than the melting point of the
- alloy they are made from, modern turbine blades are hollow and are cooled internally by
- passing cooler bleed air from the compressor through intricate internal passages.