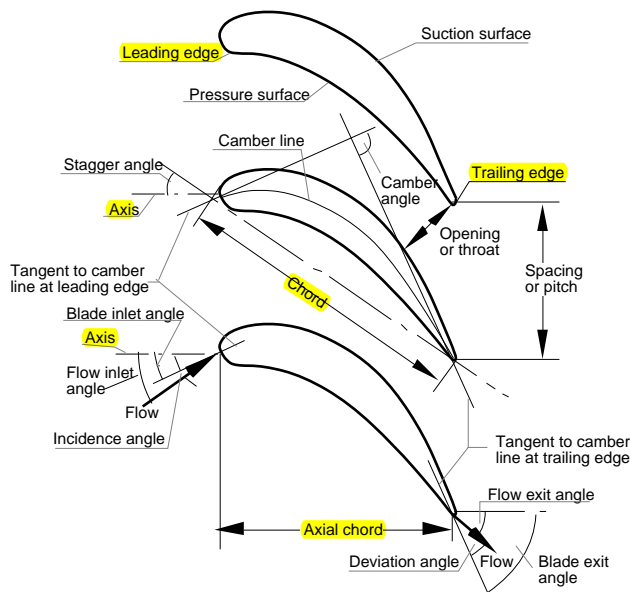
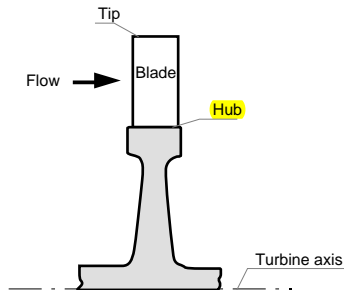


## Glossary of Terms

Written by:

**David Gordon Wilson; 1991**

"The Design of High-Efficiency Turbomachinery and Gas Turbines", pp 487-492, published by the MIT Press, Cambridge, Massachusetts, 1984, 5th printing 1991



**adiabatic**: insulated; occurring with no external heat transfer.

**aspect ratio**: the ratio of the blade height to the chord.

**axial chord**: the length of the projection of the blade, as set in the turbine, onto a line parallel to the turbine axis. It is the axial length of the blade.

**axial solidity**: the ratio of the axial chord to the spacing.

**blade exit angle**: the angle between the tangent to the camber line at the trailing edge and the turbine axial direction.

**blade height**: the radius at the tip minus the radius at the hub.

**blade inlet angle**: the angle between the tangent to the camber line at the leading

edge and the turbine axial direction.

**blower:** a rotary machine that produces a low-to-moderate pressure rise in a compressible fluid (usually air), usually incorporated in a duct. See "fan" and "compressor."

**bucket:** same as rotor blade.

**camber angle:** the external angle formed by the intersection of the tangents to the camber line at the leading and trailing edges. It is equal to the sum of the angles formed by the chord line and the camber-line tangents.

**camber line:** the mean line of the blade profile. It extends from the leading edge to the trailing edge, halfway between the pressure surface and the suction surface.

**CBE:** compressor-burner-expander, or the "simple" gas-turbine "cycle."

**CBEX:** compressor (heat exchanger)-burner-expander-heat exchanger, or the "regenerated," "recuperated," or "heat-exchanger" gas-turbine "cycle."

**chord:** the length of the perpendicular projection of the blade profile onto the chord line. It is approximately equal to the linear distance between the leading edge and the trailing edge.

**chord line:** if a two-dimensional blade section were laid convex side up on a flat surface, the chord line is the line between the points where the front and the rear of the blade section would touch the surface.

**compressor:** a rotary machine that produces a relatively high pressure rise (pressure ratios greater than 1.1) in a compressible fluid.

**deflection:** the total turning angle of the fluid. It is equal to the difference between the flow inlet angle and the flow exit angle.

**deviation angle:** the flow exit angle minus the blade exit angle.

**diffuser:** a duct or passage shaped so that a fluid flowing through it will undergo an efficient reduction in relative velocity and will therefore increase in (static) pressure.

**effectiveness:** a term applied here to define the heat-transfer efficiency of heat exchangers.

**efficiency:** performance relative to ideal performance. There are many types of efficiency requiring very precise definitions (see section 2.8).

**entropy:** a property of a substance defined in terms of other properties (see section 2.4). Its change during a process is of more interest than its absolute value. In an adiabatic process, the increase of entropy indicates the magnitude of losses occurring.

**expander:** a rotary machine that produces shaft power from a flow of compressible fluid at high pressure discharged at low pressure. In this book the only types of expander

treated are turbines.

**flow exit angle:** the angle between the fluid flow direction at the blade exit and the machine axial direction.

**flow inlet angle:** the angle between the fluid flow direction at the blade inlet and the machine axial direction.

**head:** the height to which a fluid would rise under the action of an incremental pressure in a gravitational field.

**hub:** the portion of a turbomachine bounded by the inner surface of the flow annulus.

**hub-tip ratio:** same as hub-to-tip-radius ratio.

**hub-to-tip-radius ratio:** the ratio of the hub radius to the tip radius.

**incidence angle:** the flow inlet angle minus the blade inlet angle.

**intensive property:** a property that does not increase with mass; for instance, the pressure and temperature of a body of material do not double if an equal mass at the same temperature and pressure is joined to it. (The energy, on the other hand, would double.)

**intercoolers:** heat exchangers that cool a gas after initial compression and before subsequent compression.

**isentropic :** occurring at constant entropy.

**isothermal:** occurring at constant temperature.

**leading edge:** the front, or nose, of the blade.

**mean section:** the blade section halfway between the hub and the tip.

**meridional plane:** a plane cutting a turbomachine through a diametral line and the (longitudinal) axis.

**nozzle blade:** same as stator blade, for turbines only.

**pitch:** the distance in the direction of rotation between corresponding points on adjacent blades.

**pressure surface:** the concave surface of the blade. Along this surface, pressures are highest.

**pump:** a machine that increases the pressure or head of a fluid. In connection with turbomachinery it usually refers to a rotary machine operating on a liquid.

**radius ratio:** same as hub-to-tip-radius ratio.

**recuperator :** a heat exchanger, defined in this book as one with nonmoving surfaces, transferring heat from a hot fluid to a cold fluid.

**regenerated cycle:** see "CBEX."

**regenerator:** a heat exchanger, defined in this book as one having moving surfaces or valves switching the hot and cold flows.

**reheat:** the effect of losses in increasing the outlet enthalpy, or in decreasing the steam wetness, in a steam-turbine expansion. Also see "reheat combustor."

**reheat combustor:** a combustor fitted between two turbines to bring the gas temperature at inlet to the second turbine to approach the temperature at inlet to the first.

**root:** the compressor or turbine-blade section attaching it to its mounting platform. Rotor-blade root sections are normally at the hub, and stator-blade roots at the shroud.

**rotor:** the rotating part of a machine, usually the disk or drum plus the rotor blades.

**rotor blade:** a rotating blade.

**separation:** when a fluid flowing along a surface ceases to go parallel to the surface but flows over a near-stagnant bubble, or an eddy, or over another stream of fluid.

**shroud:** the surface defining the outer diameter of a turbomachine flow annulus.

**solidity:** the ratio of the chord to the spacing.

**spacing:** same as pitch.

**specific:** per unit mass (when applied to an extensive property, such as enthalpy, energy, entropy).

**specific fuel consumption:** mass of fuel consumed per unit work output.

**specific power:** the power output of an engine divided by the mass-flow rate of the working fluid.

**stagger angle:** the angle between the chord line and the turbine axial direction (also known as the setting angle).

**stall:** the condition of operation (usually defined by the incidence) of an airfoil, or row of airfoils, at which the fluid deflection begins to fall rapidly and/or the fluid losses increase rapidly.

**static (conditions):** conditions or properties of fluids as they would be measured by instruments moving with the flow.

**stator:** the stationary part of a machine, normally that part defining the flow path.

**stator blade:** a stationary blade.

**suction surface:** the convex surface of the blade. Along this surface, pressures are lowest.

**surge:** the unstable operation of a high-pressure-ratio compressor whose stalls propagate upstream from the high-pressure stages or components allowing reverse flow and the discharge of the reservoir of high-pressure fluid, followed by re-establishment of forward flow and a repetition of the sequence.

**tip:** the outermost section of the blade or "vane."

**total (conditions):** conditions or properties of fluids as they would be measured by stationary instruments that bring the fluid isentropically to rest.

**trailing edge:** the rear, or tail, of the blade.

**transverse** plane: the plane normal to the axis of a turbomachine.

**turbine:** a rotary machine that produces shaft power by extracting energy from a stream of fluid passing through it, using only fluid-dynamic forces (as distinct from "positive-displacement" or piston-and-cylinder-like machines).

**turbomachine:** as for "turbine," except that the shaft power may be produced or absorbed, and the energy may be extracted from or added to a stream of fluid.

**working fluid:** is the fluid that undergoes compression, expansion, heating, cooling, and other processes in a heat-engine cycle. In an open-cycle gas turbine the working fluid is air.