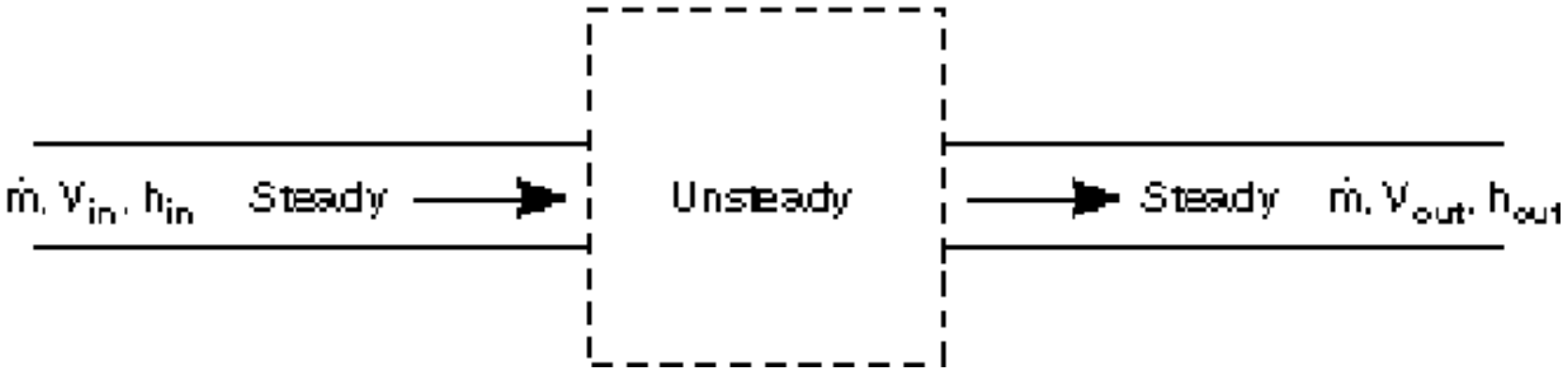
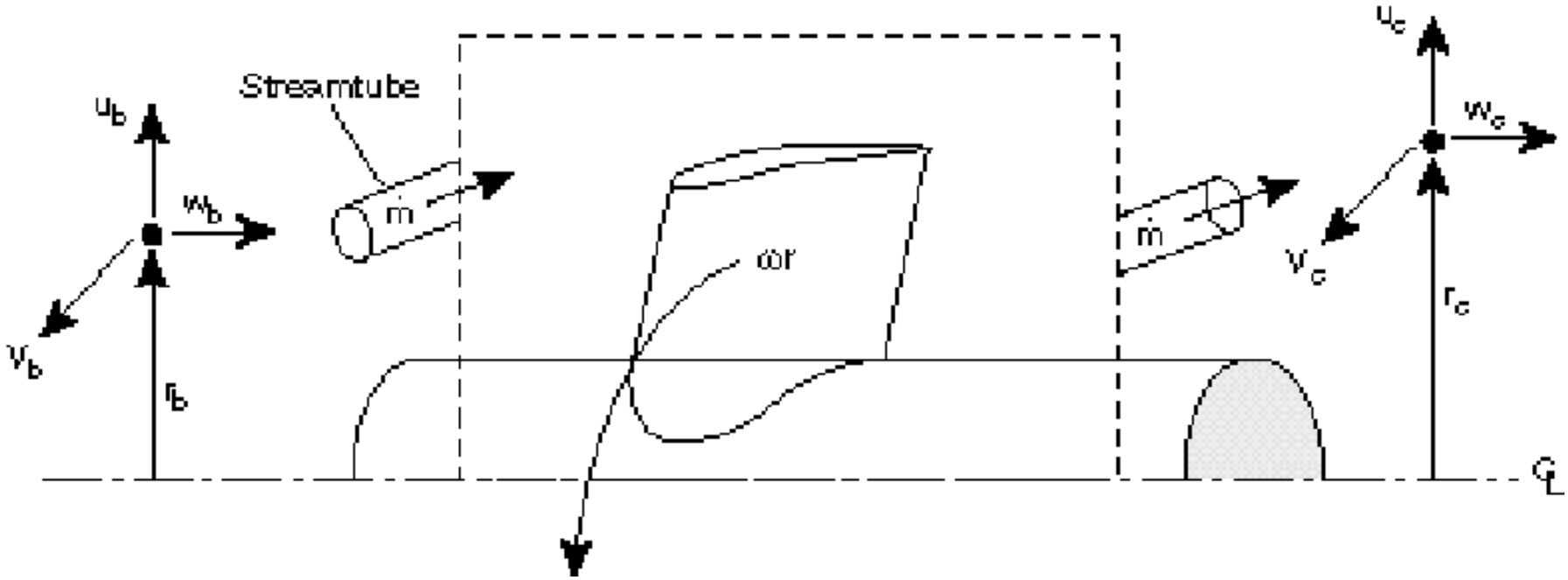
UNSTEADY PROCESS IS REQUIRED TO CHANGE TOTAL ENTHALPY OF THE FLOW



EULER TURBINE EQUATION



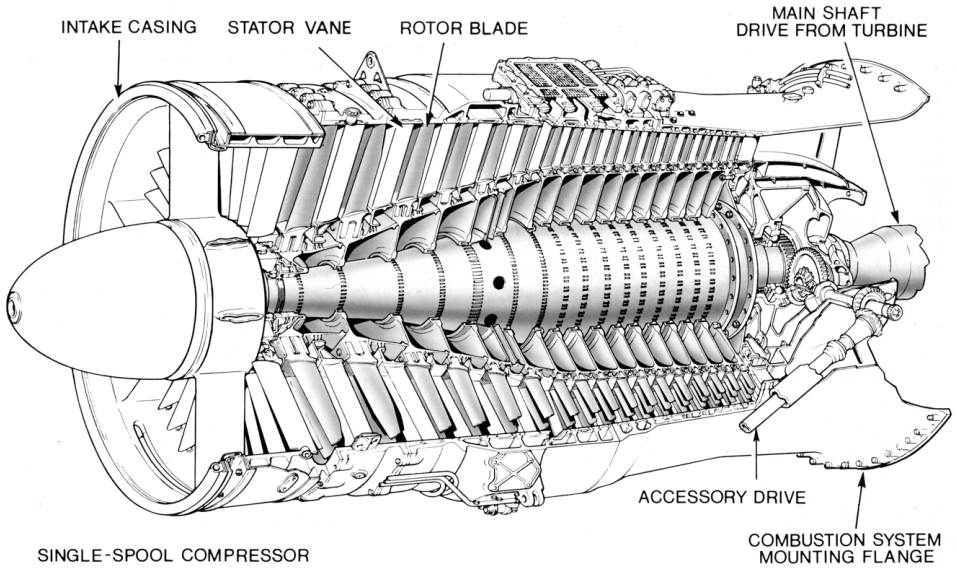
Torque ~ Axial flux of ang. mom. $T=m(r_c v_c - r_b v_b)$

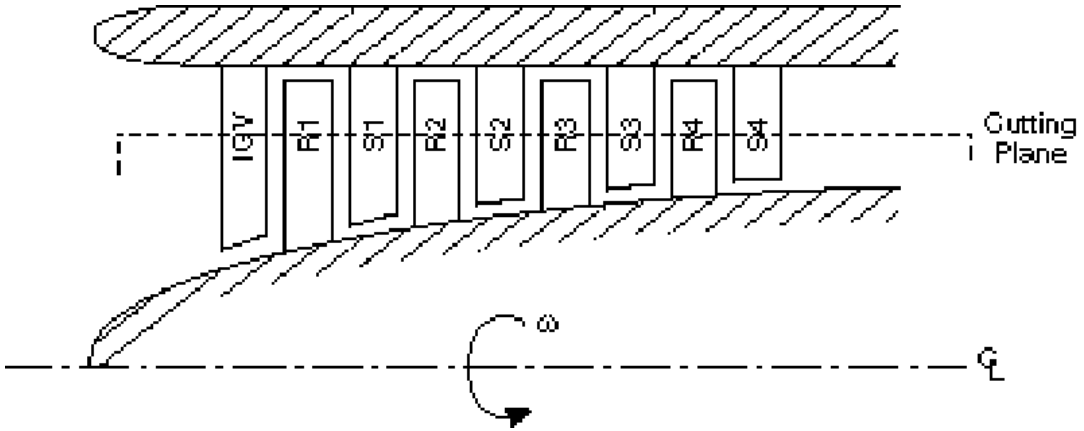
Power = ΩT

Power = mass flow (Ωh_T)

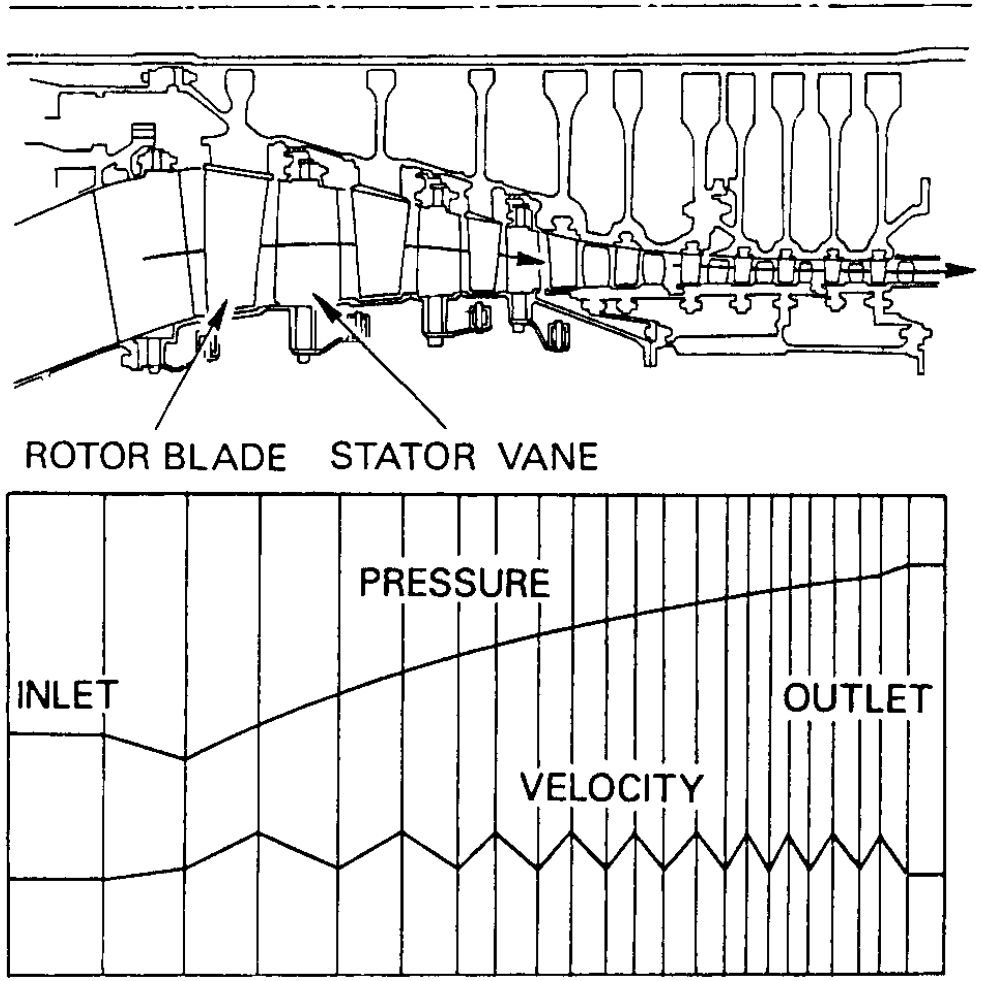
$$C_p (T_{Tc} - T_{Tb}) = \Omega (r_c v_c - r_b v_b)$$

MULTI-STAGE AXIAL COMPRESSOR





MULTISTAGE AXIAL COMPRESSOR



CONCEPTUALLY

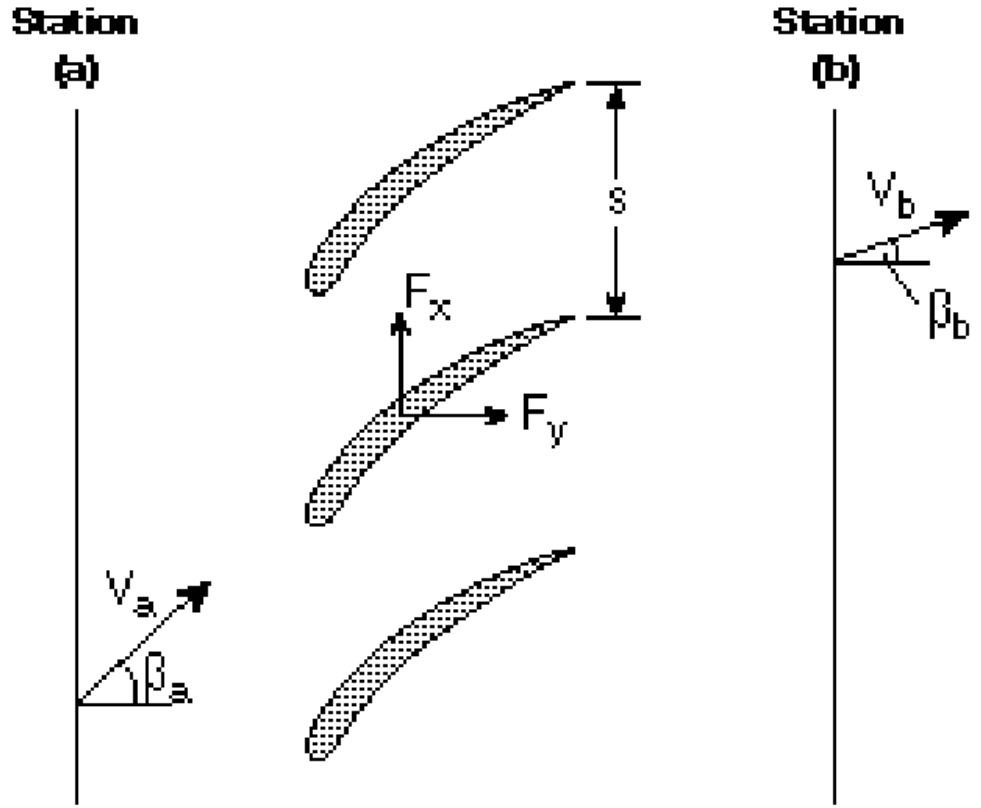
- **Rotor (rotating part) adds or removes energy**
  - **changes swirling component of kinetic energy, leaves axial component about the same**

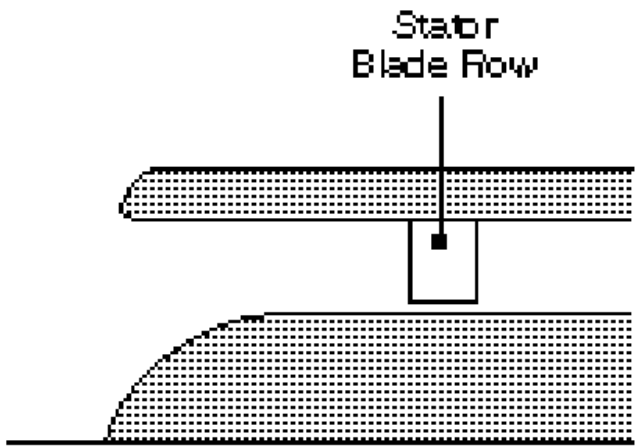
$$P_T = p + \frac{1}{2}\rho\left(u^2 + v^2 + w^2\right)$$

Internal energy — Radial k.e. (small) — Tangential k.e. (swirl) — Axial k.e.

- **Stator (stationary part) does not add or remove energy (there is a torque but no ρ)**
  - **Changes swirl component of kinetic energy into internal energy, leaves axial component about the same**

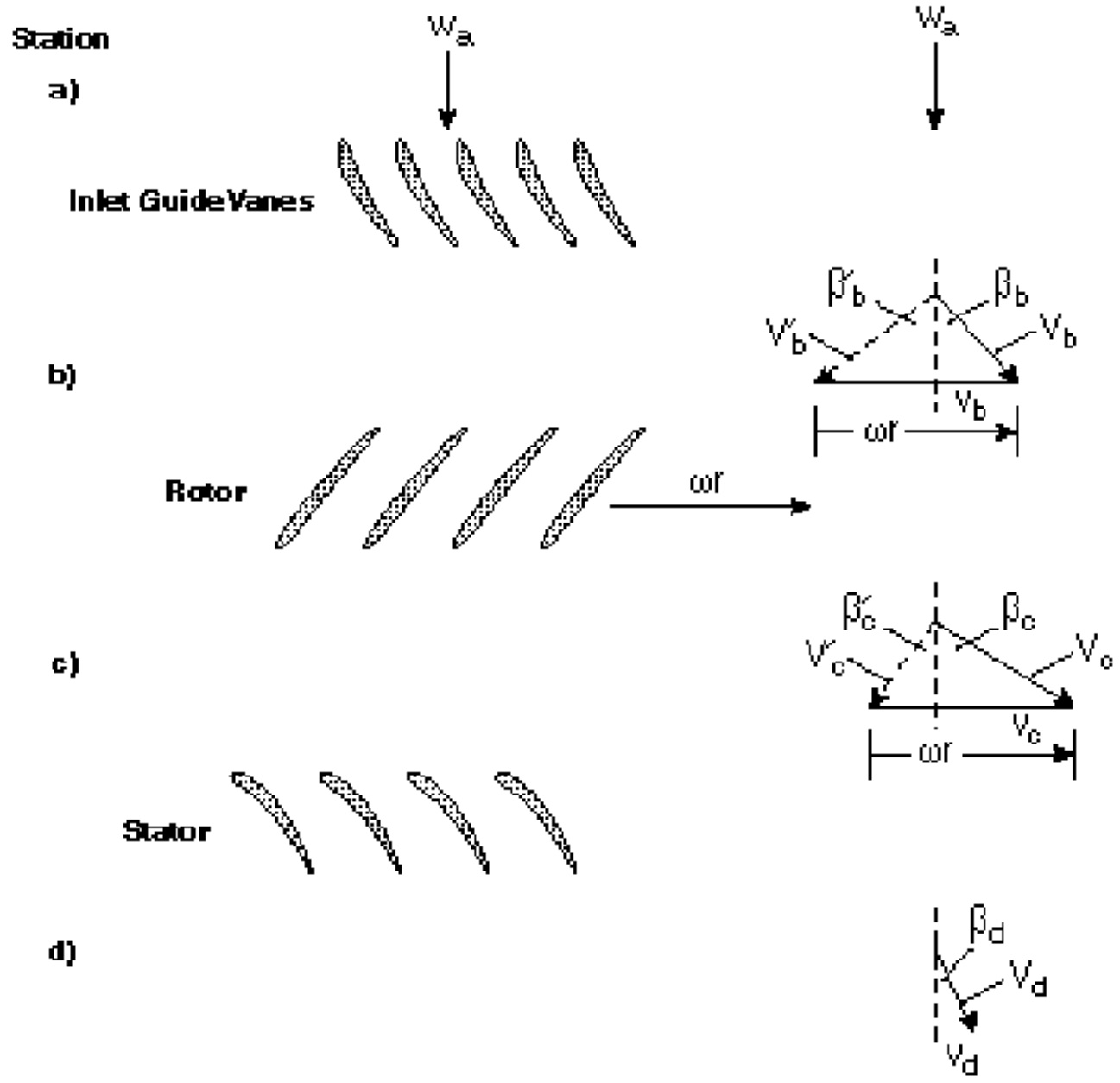
A STATOR IS A NOZZLE
(ACCELERATES OR DECELERATES FLOW)





Stator in Constant
Area Annular Duct

VELOCITY TRIANGLES



RULES

1) **Always consider blade in reference frame attached to the blade**

2) **For now (Unified) assume axial velocity and radius are constant throughout the blade rows**

3) **Flow always leaves blades at the trailing edge angle**

4) **Check inlet flow angle to next row to make sure flow is roughly aligned with blade (in blade reference frame)**

5) **Can only have work done across moving blade rows**

6) **Check change in stationary reference frame tangential velocity across moving stages to assess work input or extraction**

    An increase in stationary frame tangential velocity in the direction of rotor motion means work added to flow

    A decrease in stationary frame tangential velocity in the direction of rotor motion means work added to flow