UNSTEADY PROCESS IS REQUIRED TO CHANGE TOTAL ENTHALPY OF THE FLOW
EULER TURBINE EQUATION

Torque \sim Axial flux of ang. mom. \quad T = m(r_c v_c - r_b v_b)

Power = \square T

Power = mass flow (\square h_T)

\begin{align*}
C_p (T_{Tc} - T_{Tb}) &= \square (r_c v_c - r_b v_b)
\end{align*}
MULTI-STAGE AXIAL COMPRESSOR

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MULTISTAGE AXIAL COMPRESSOR

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CONCEPTUALLY

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

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

• Stator (stationary part) does not add or remove energy (there is a torque but no \( \square \))
  - Changes swirl component of kinetic energy into internal energy, leaves axial component about the same
A STATOR IS A NOZZLE
(ACCELERATES OR DECELERATES FLOW)
VELOCITY TRIANGLES

a) Inlet Guide Vanes

b) Rotor

c) Stator

d)
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