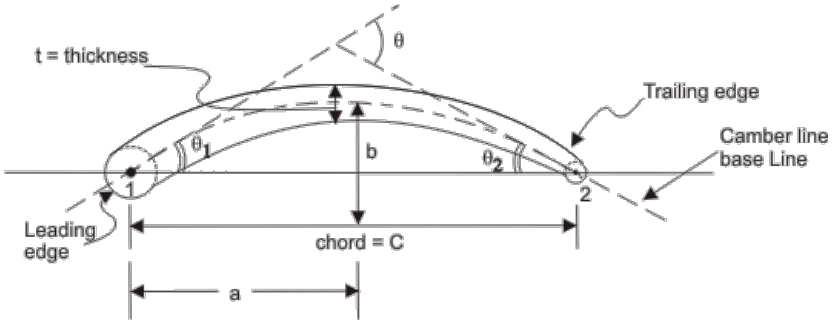
Cascade Nomenclature

An aerofoil is build up around a basic camber line, which is usually a curricular or a parabolic arc (figure below). An camber line is thus the skeleton of the aerofoil. A thickness *t* is distributed over the camber line with the leading and trailing edge circles that finally form an aerofoil.

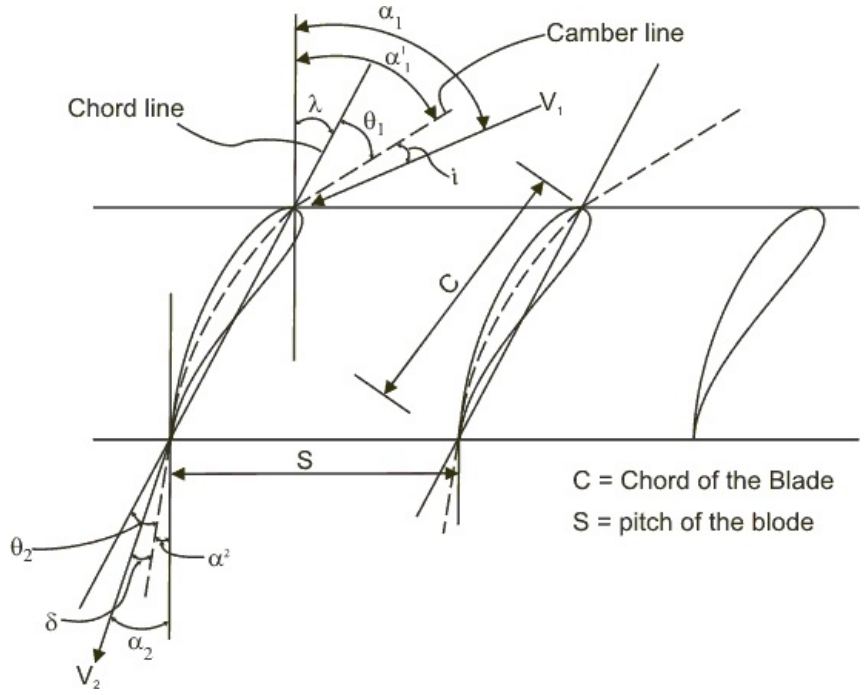


In the above figure, the dotted line indicates the camber line and 'a' is the distance from the leading edge for maximum camber and 'b' is the maximum displacement from the chord line. A cascade geometry is defined completely by the aerofoil specification, pitch-chord ratio (pitch is the spacing between two consecutive blade) and the chosen setting i.e. stagger angle λ (shown below).

θ is called the aerofoil camber angle i.e. $\theta = \theta_1 + \theta_2$. For a circular arc, $\theta_1 = \theta_2 = \theta/2$ and a/c = 0.5. For a parabolic arc a/c < 0.5.

Compressor Cascade

The different geometric angles, blade setting and their relationship with the flow angles for a compressor cascade are defined below.



λ = stagger angle (positive for a compressor cascade)

α_1' = blade inlet angle = $\lambda + \theta_1$

α_2' = blade outlet angle = $\lambda - \theta_2$

The angle of incidence '*i*' is the angle made by the inlet flow V_1 with the camber line. Under a perfect situation, the flow will leave along the camber line at the trailing edge of the blade. But it does not really happen so and there is a deviation which is denoted by 'δ'. Thus, the air inlet angle,

$\alpha_1 = \lambda + \theta_1 + i$

and air outlet angle, $\alpha_2 = \lambda - \theta_2 - \delta$

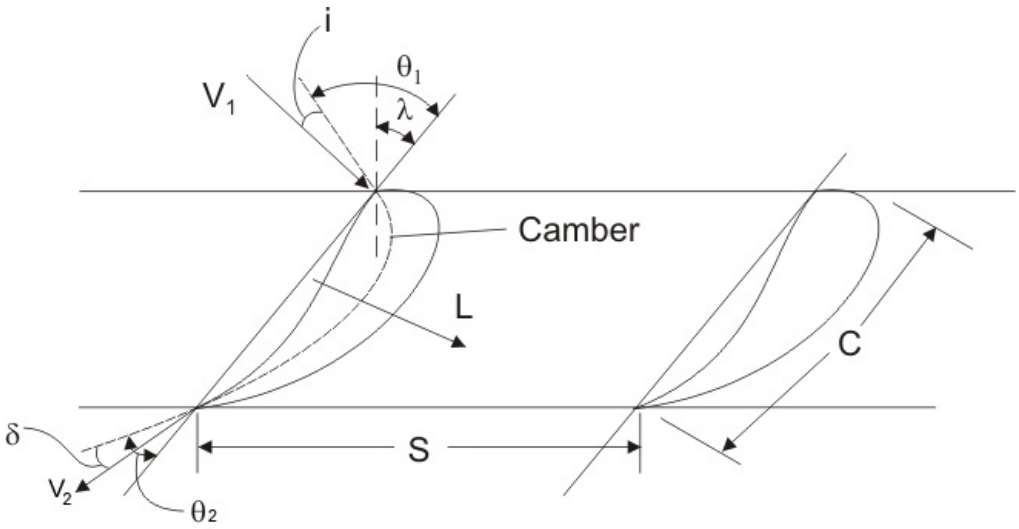
Hence, ε = deflection of flow = $\alpha_1 - \alpha_2$

$= (\theta_1 + \theta_2) + i - \delta$

$= \theta + i - \delta$

Turbine Cascade

The different geometric angles and the blade setting of a turbine cascade are shown in the figure below.



λ stagger is the stagger which is negative for a turbine cascade.

To be noted: The difference between the orientation of Compressor cascade and that of the Turbine cascade.

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