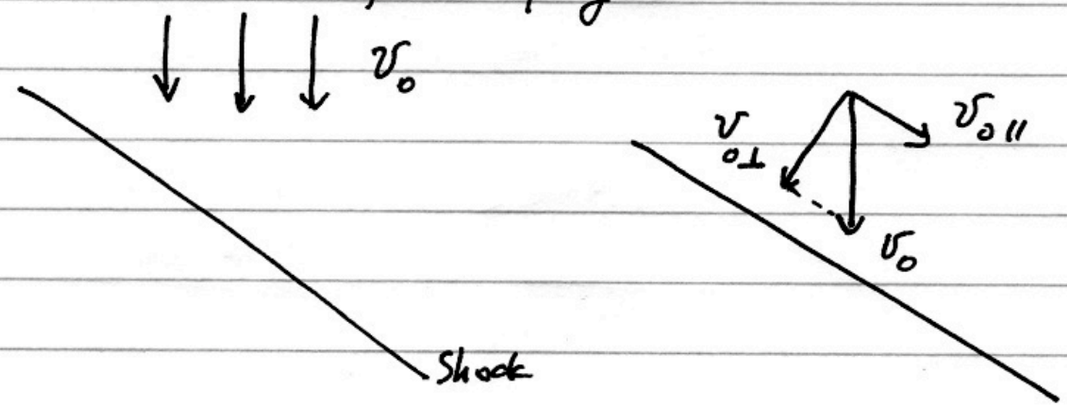
Oblique Shocks

Oblique shock

Consider a shock wave, which propages at some angle relative to the flow of gas:



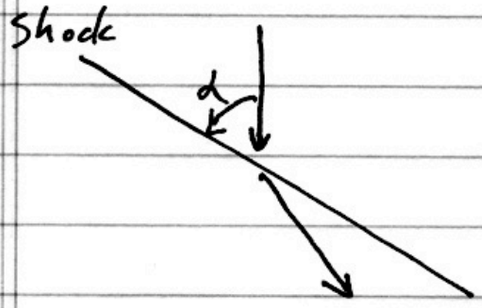
Perpendicular component of velocity $v_{0\perp}$ will decrease after the shock:

$$\rho_1 v_{1\perp} = \rho_0 v_{0\perp}$$

Because $\rho_1 > \rho_0 \Rightarrow v_{1\perp} < v_{0\perp}$

However, the parallel component is preserved: $v_{1\parallel} = v_{0\parallel}$

As the result, streamlines get closer to the shock:



Gas before the shock must be supersonic. After the shock gas can be either sub or syper - sonic.

There is a limit on angle α, which follows from condition that $v_{0\perp} > c_0$

From geometry $v_{0\perp} = v_0 \sin\alpha \Rightarrow$

$$\sin\alpha > \frac{c_0}{v_0} = \frac{1}{M_0}$$