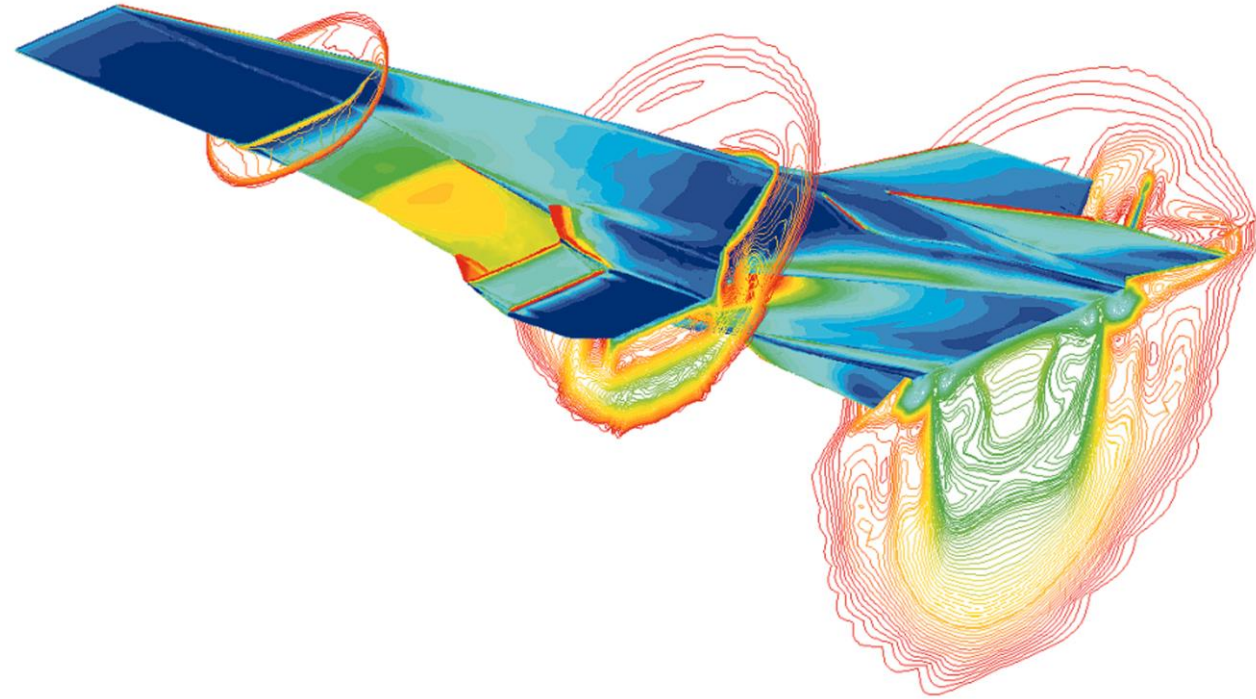


Streamfunction Vorticity Formulation

SEBASTIAN THOMAS



$$\rho_{\infty} \frac{\partial}{\partial t} (\omega) + \rho_{\infty} u \frac{\partial}{\partial x} (\omega) + \rho_{\infty} v \frac{\partial}{\partial y} (\omega) = \mu \frac{\partial^2}{\partial x^2} (\omega) + \mu \frac{\partial^2}{\partial y^2} (\omega)$$

$$u = \frac{\partial \psi}{\partial y}$$

$$v = -\frac{\partial \psi}{\partial x}$$

$$\omega = \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \right)$$

$$\rho_{\infty} \frac{\partial \omega}{\partial t} + \rho_{\infty} \frac{\partial \psi}{\partial y} \frac{\partial \omega}{\partial x} - \rho_{\infty} \frac{\partial \psi}{\partial x} \frac{\partial \omega}{\partial y} = \mu \frac{\partial^2 \omega}{\partial x^2} + \mu \frac{\partial^2 \omega}{\partial y^2}$$

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = -\omega$$

Error in Lecture (at 7:10 mark): this sign was incorrectly written as +
(Hat tip to Thomas Kopf for identifying the error)