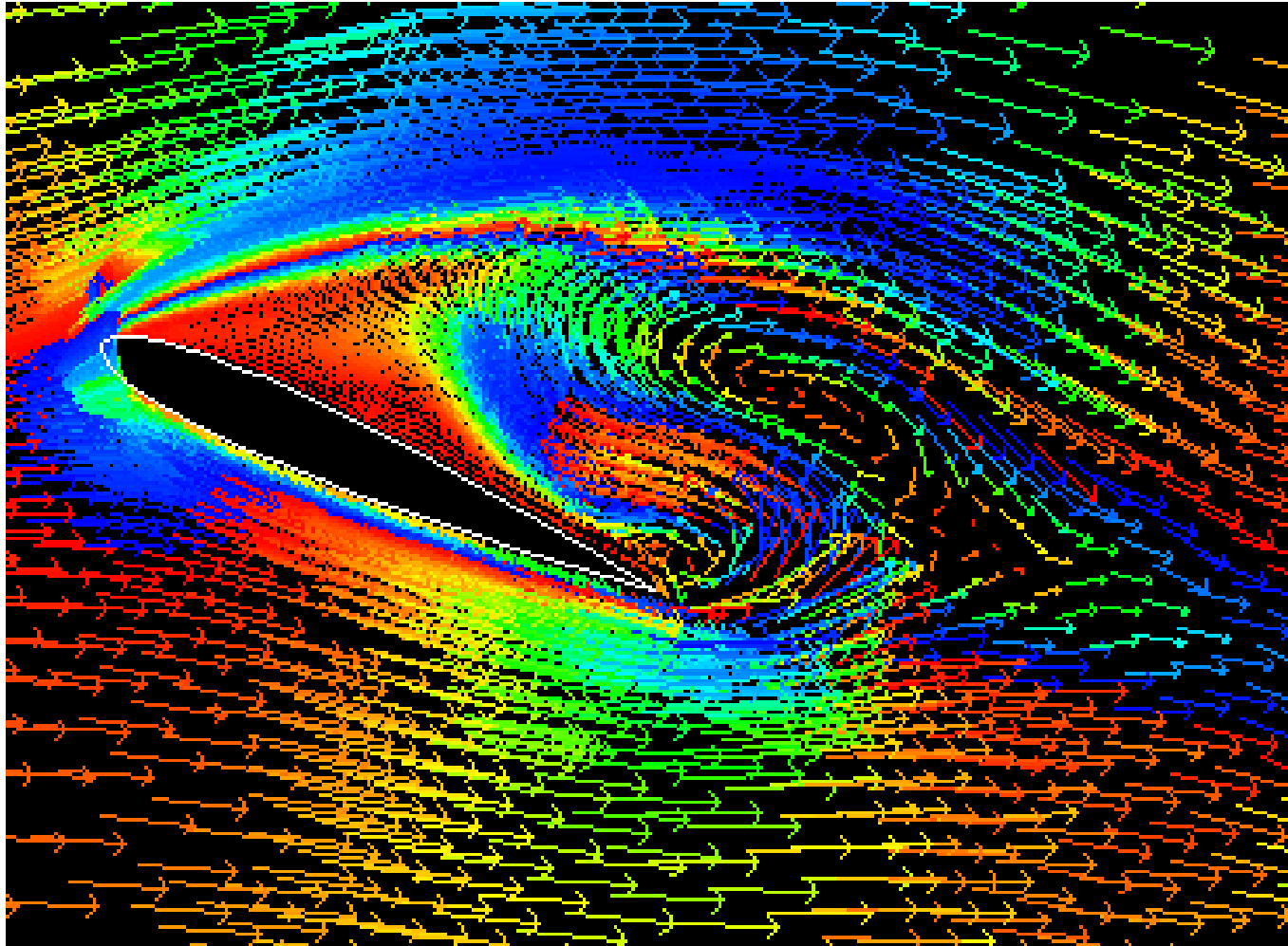


# **Mecânica dos Fluidos**

**(Exemplos de aplicações para  
Engenharia Mecânica)**

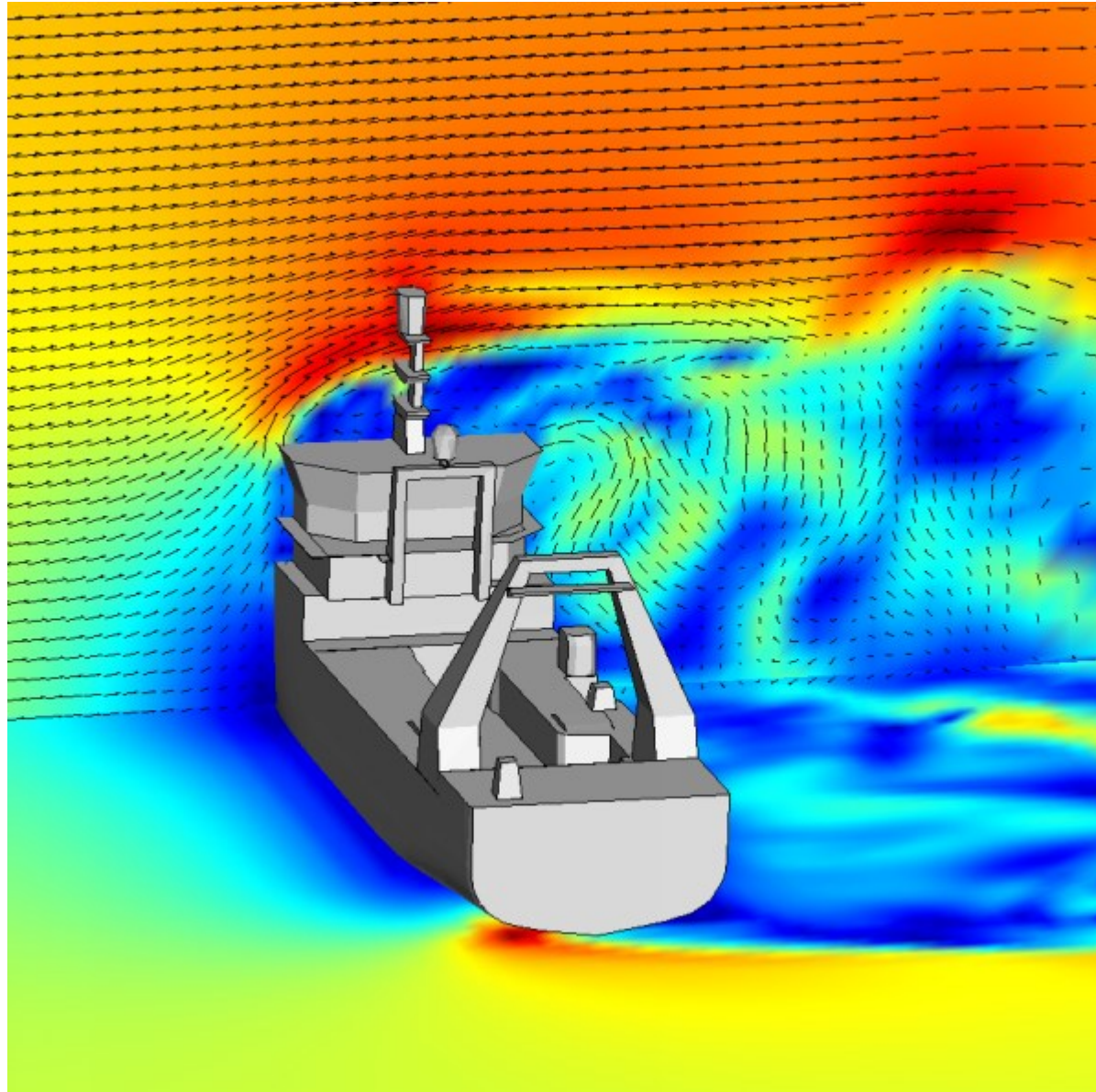
# *Campos de Velocidades*

Soluções continuidade e QDM ([www.math.chalmers.se](http://www.math.chalmers.se))



# *Campos de Velocidades*

Soluções continuidade e QDM ([www.gfs.sourceforge.net](http://www.gfs.sourceforge.net))



# *Linhas de Corrente*

## Função Corrente

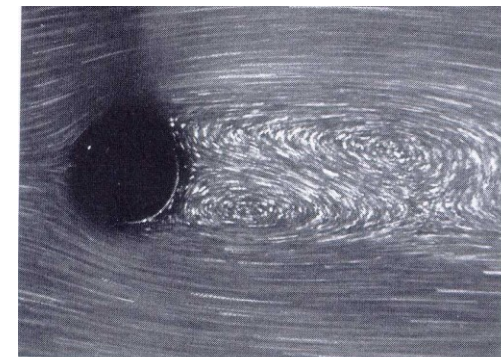
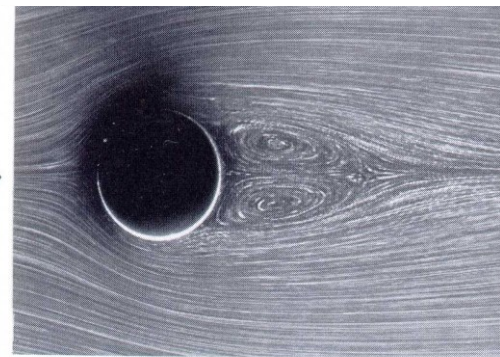
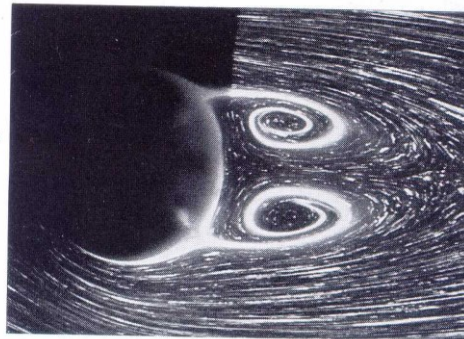
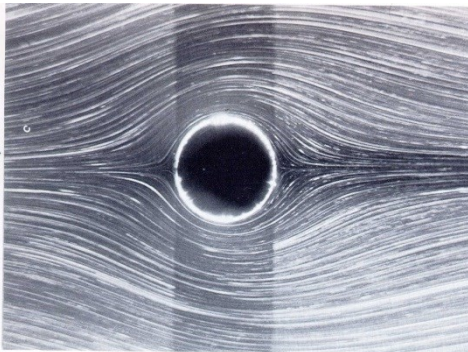
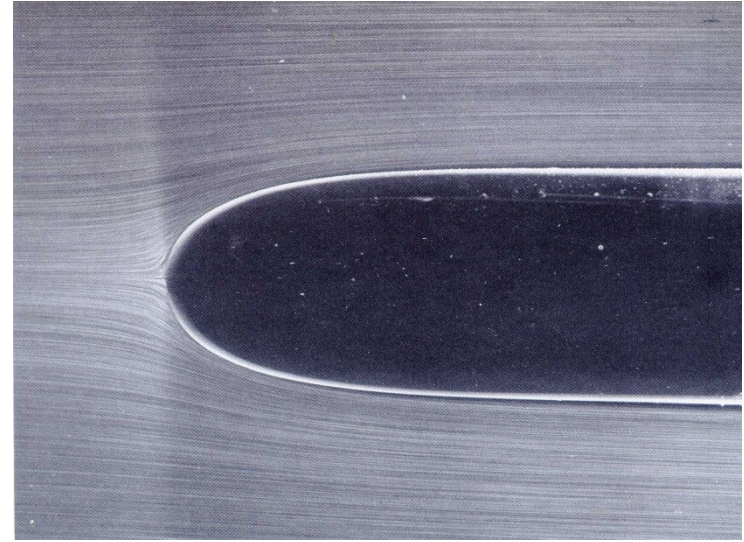
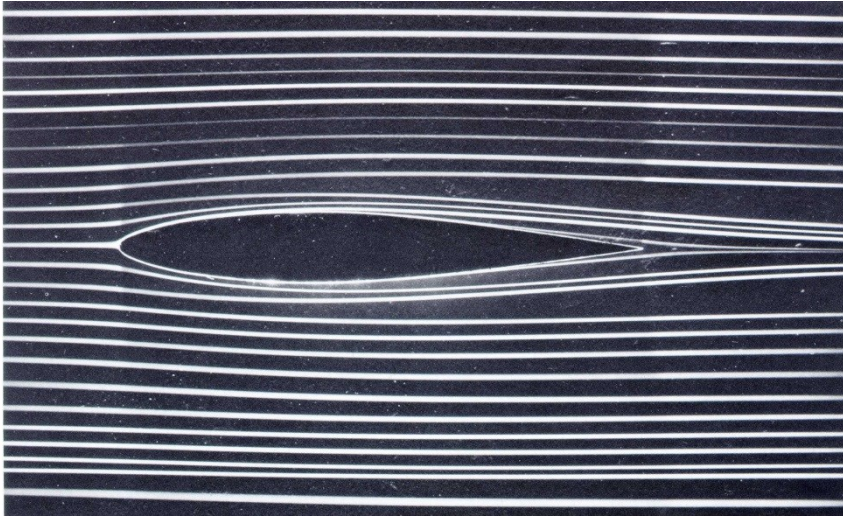


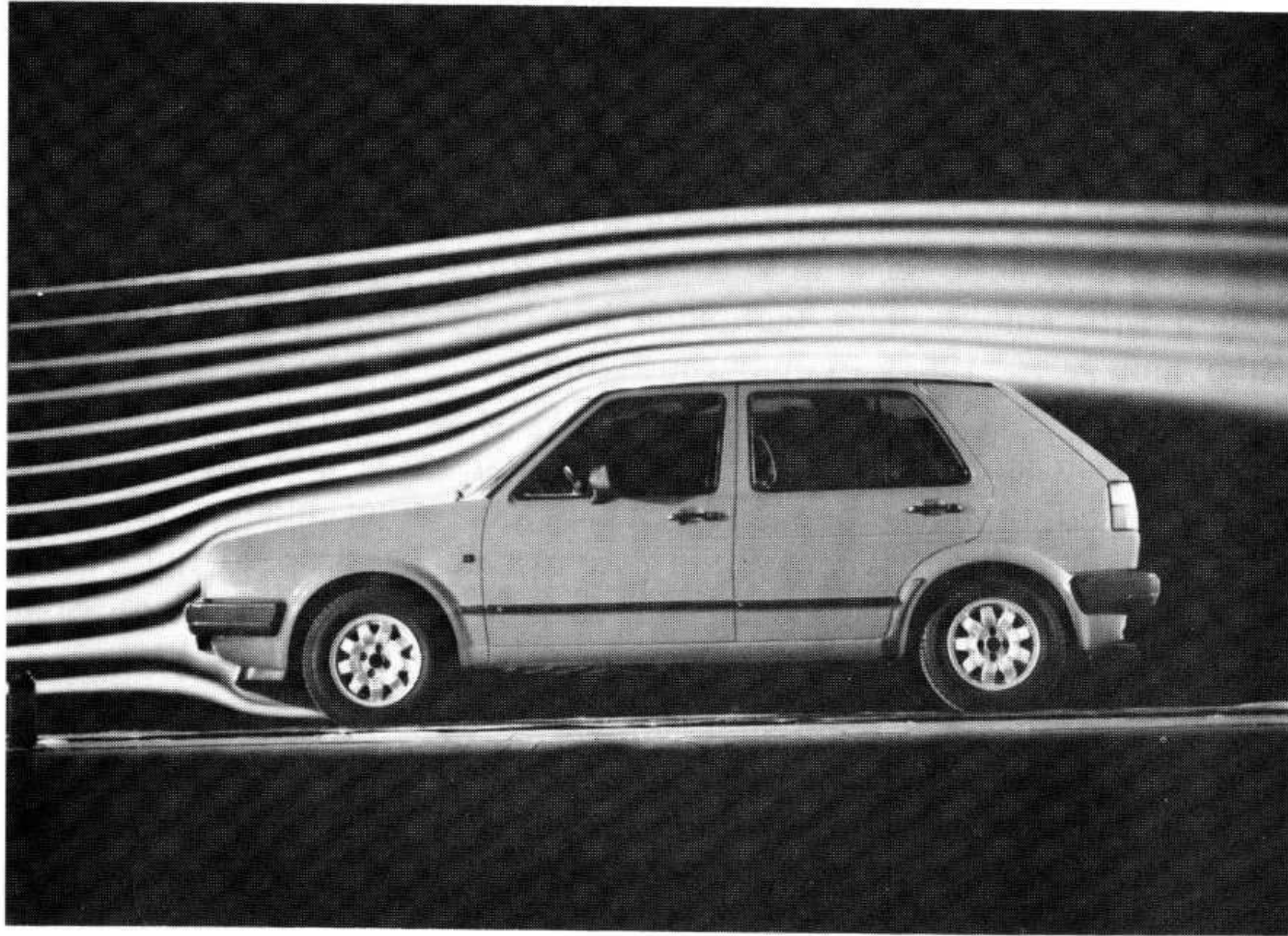
Fig. 3. Flow around a circular cylinder at  $Re = 19$  (water, flow velocity 0.20 cm/s, cylinder diameter 1.0 cm, aluminium powder method and electrolytic precipitation method).

Fig. 4. Flow around a circular cylinder at  $Re = 26$  (water, flow velocity 0.25 cm/s, cylinder diameter 1.0 cm, aluminium powder method).

Fig. 5. Flow around a circular cylinder at  $Re = 55$  (water, flow velocity 0.55 cm/s, cylinder diameter 1.0 cm, aluminium powder method).

# *Linhas de Corrente*

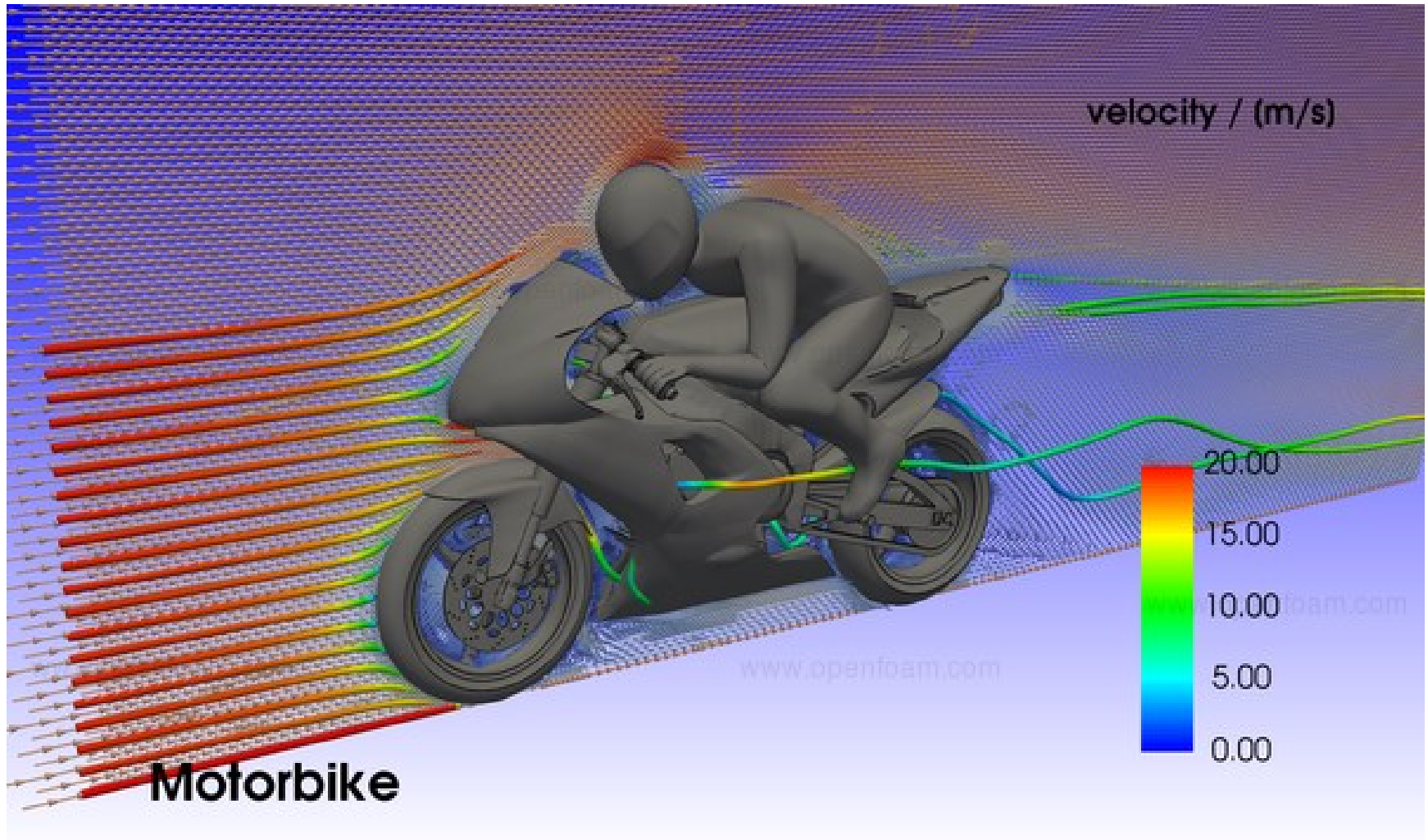
## Função Corrente



*Fig. 2.13* Smoke lines around a road vehicle in a full-scale wind tunnel. (Courtesy of Volkswagenwerk AG.)

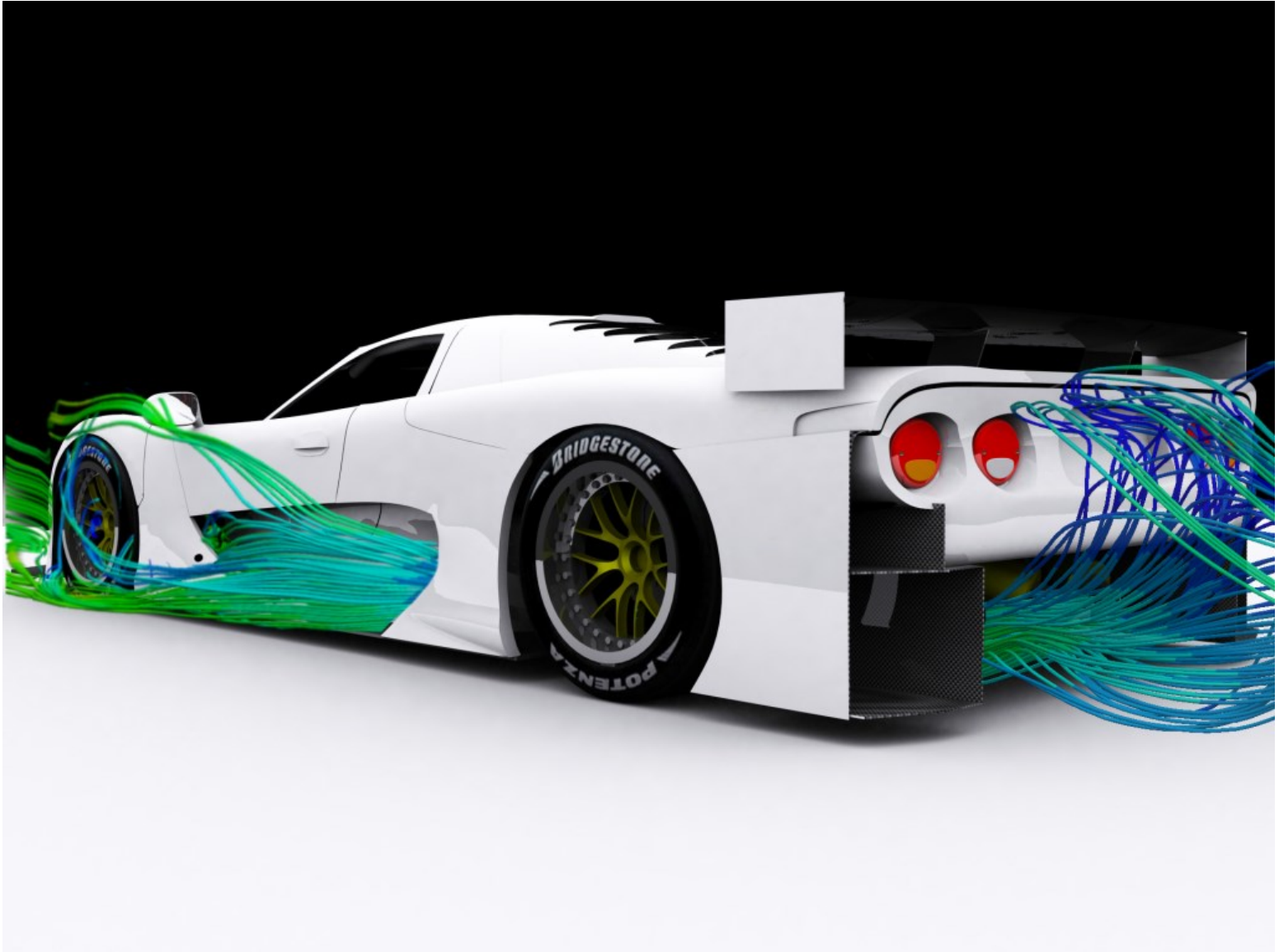
# *Linhas de Corrente*

Função Corrente (www.openfoam.com)



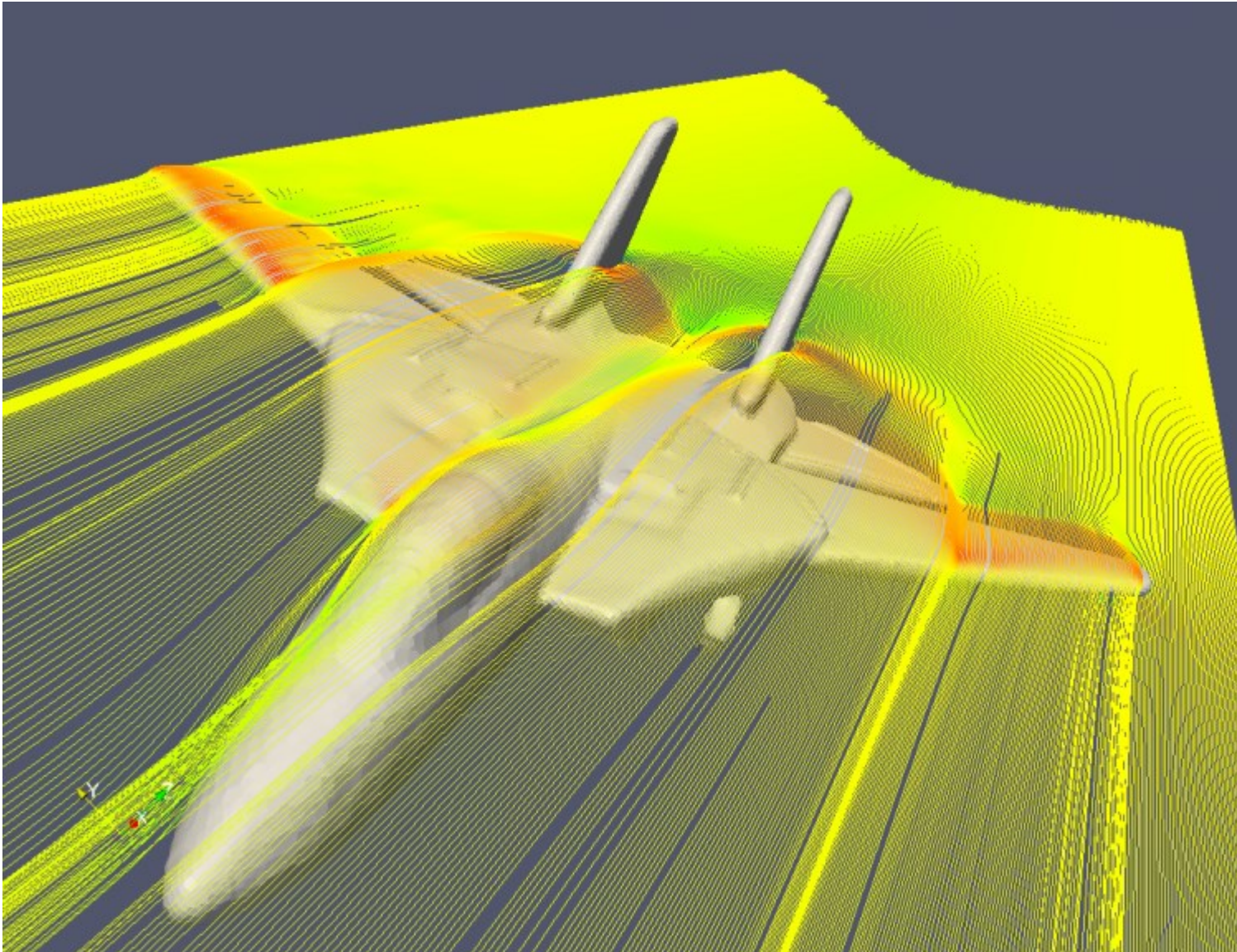
# *Linhas de Corrente*

Função Corrente ([www.totalsimulation.co.uk](http://www.totalsimulation.co.uk))



# *Linhas de Corrente*

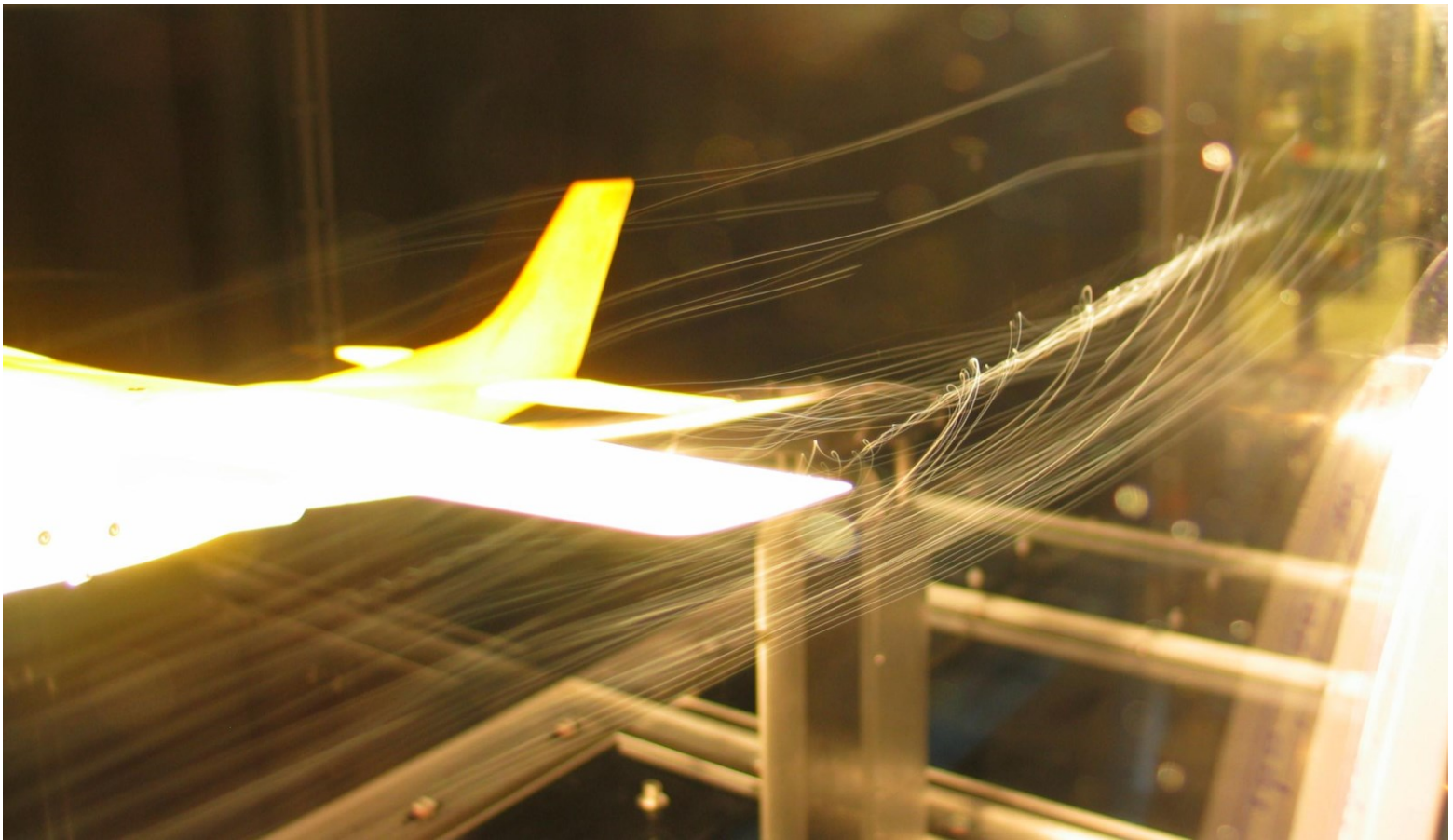
Função Corrente ([hmf.enseeiht.fr](http://hmf.enseeiht.fr))





# *Vorticidade em Esteiras e Turbillões*

Vorticidade ou rotação (em.wikipedia.org)



# *Vorticidade em Esteiras e Turbillões*

Vorticidade ou rotação (em.wikipedia.org)





MIG-21 (<http://www.jalopnik.com.br>)

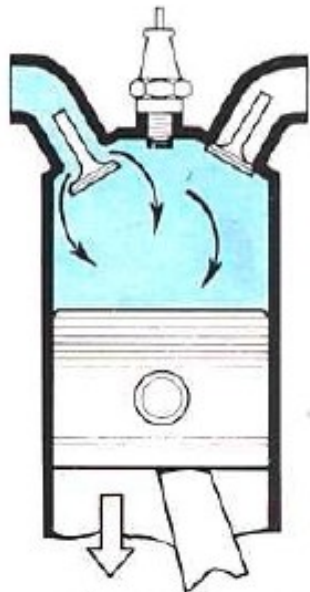
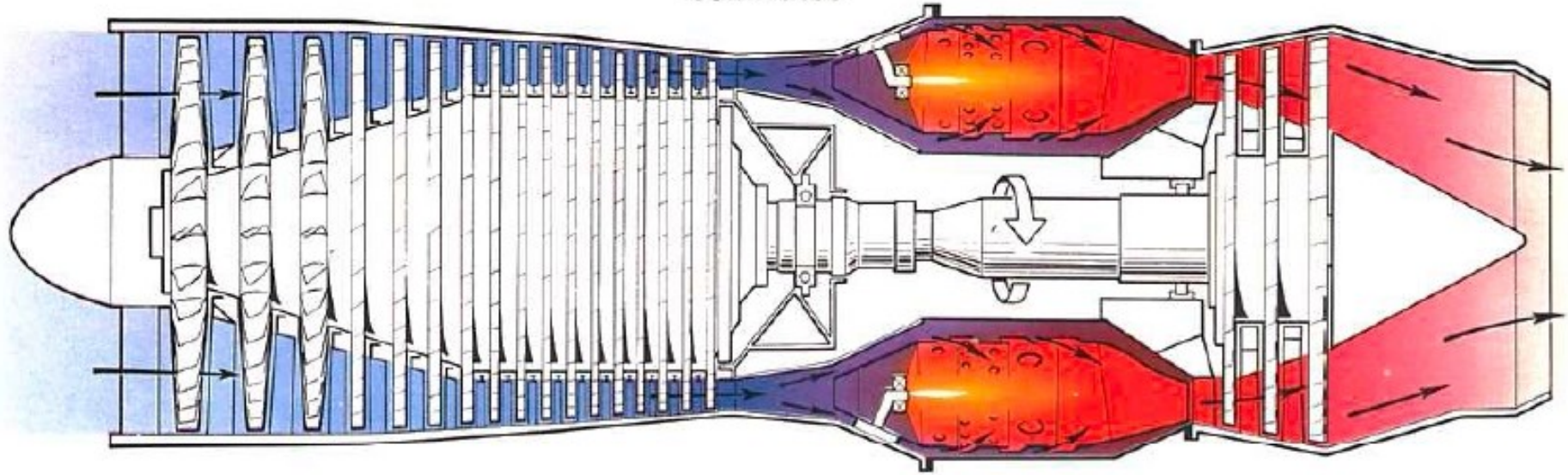
AIR INTAKE

COMPRESSION

Continuous

COMBUSTION

EXHAUST



AIR/FUEL INTAKE

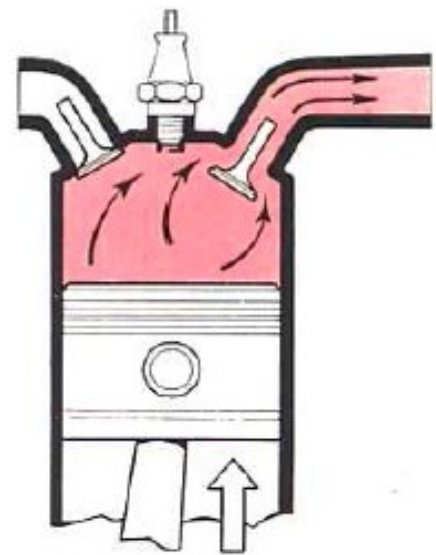


COMPRESSION

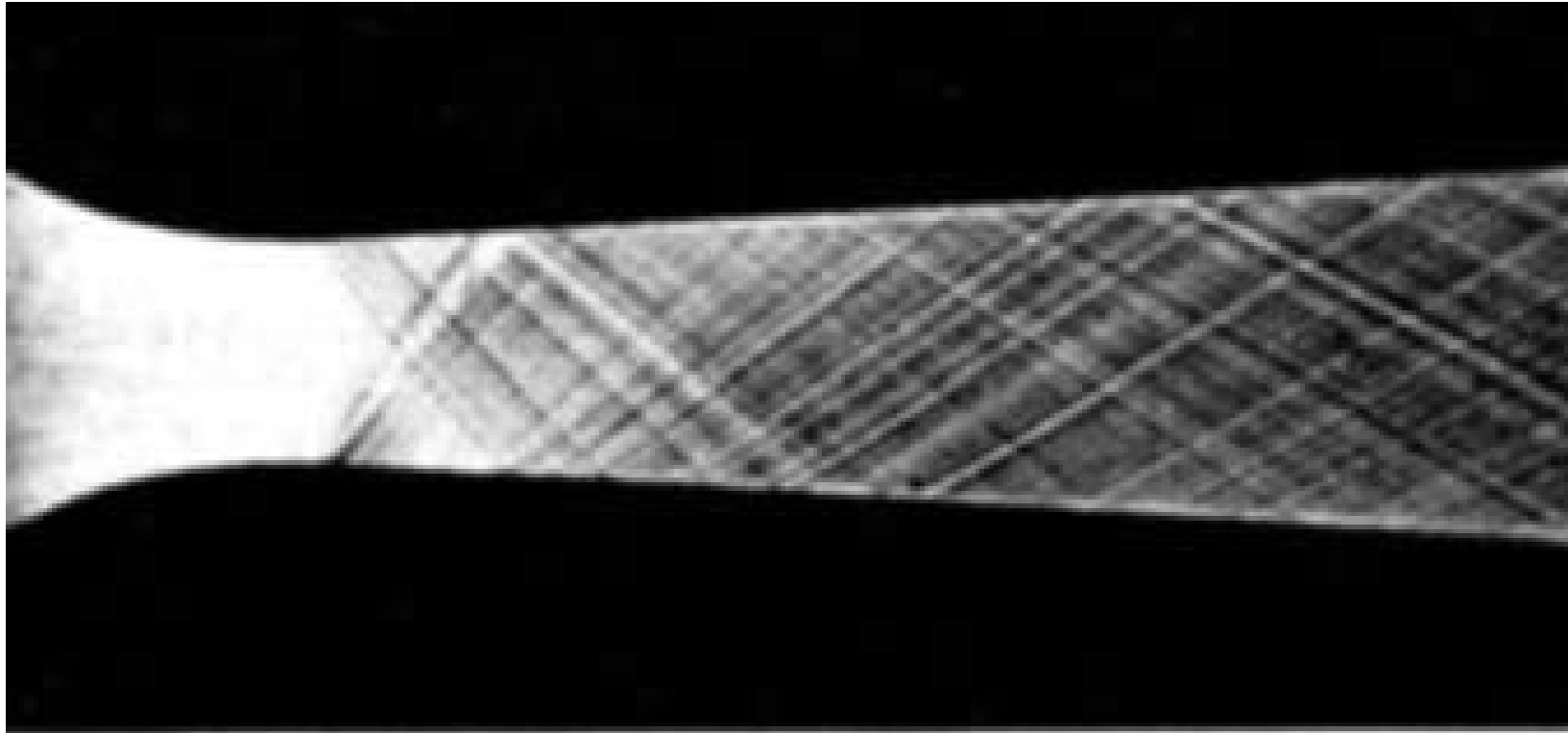
Intermittent



COMBUSTION



EXHAUST



Penn State, College of Engineering Mechanical &  
Nuclear Engineering  
<http://www.mne.psu.edu/psgdl/courses.html>



F-16 (Lockheed) [http://en.wikipedia.org/wiki/File:South\\_Carolina\\_F-16\\_taking\\_off\\_in\\_Afghanistan.jpg](http://en.wikipedia.org/wiki/File:South_Carolina_F-16_taking_off_in_Afghanistan.jpg)

# *Vorticidade em Esteiras e Turbillões*

## Vorticidade ou rotação

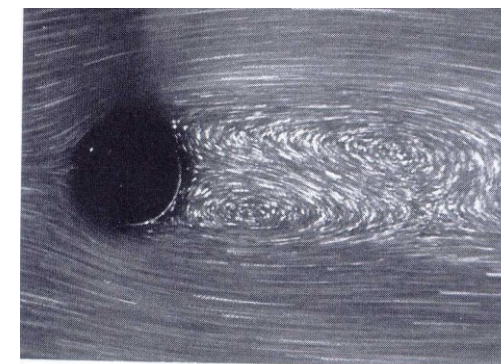
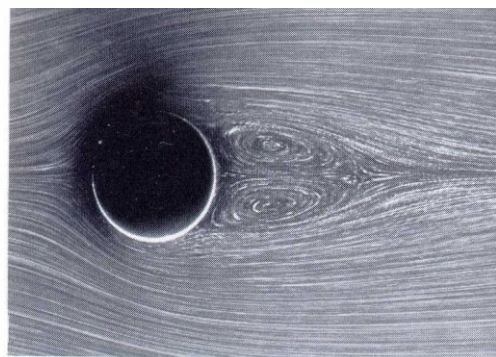
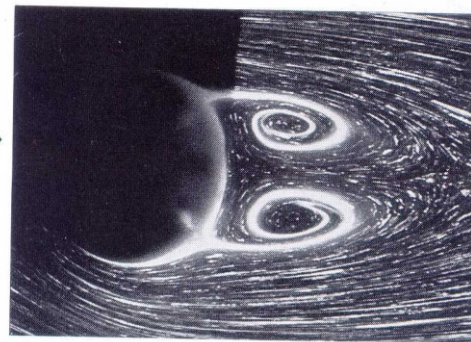
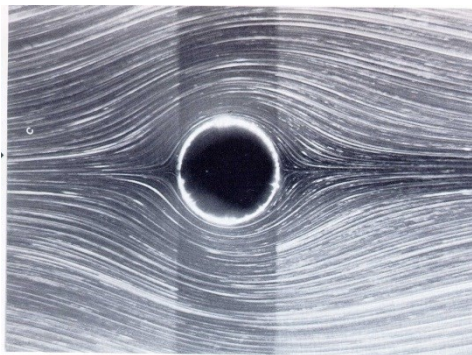


Fig. 3. Flow around a circular cylinder at  $Re = 19$  (water, flow velocity 0.20 cm/s, cylinder diameter 1.0 cm, aluminium powder method and electrolytic precipitation method).

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# *Campos de Velocidades*

Soluções continuidade e QDM

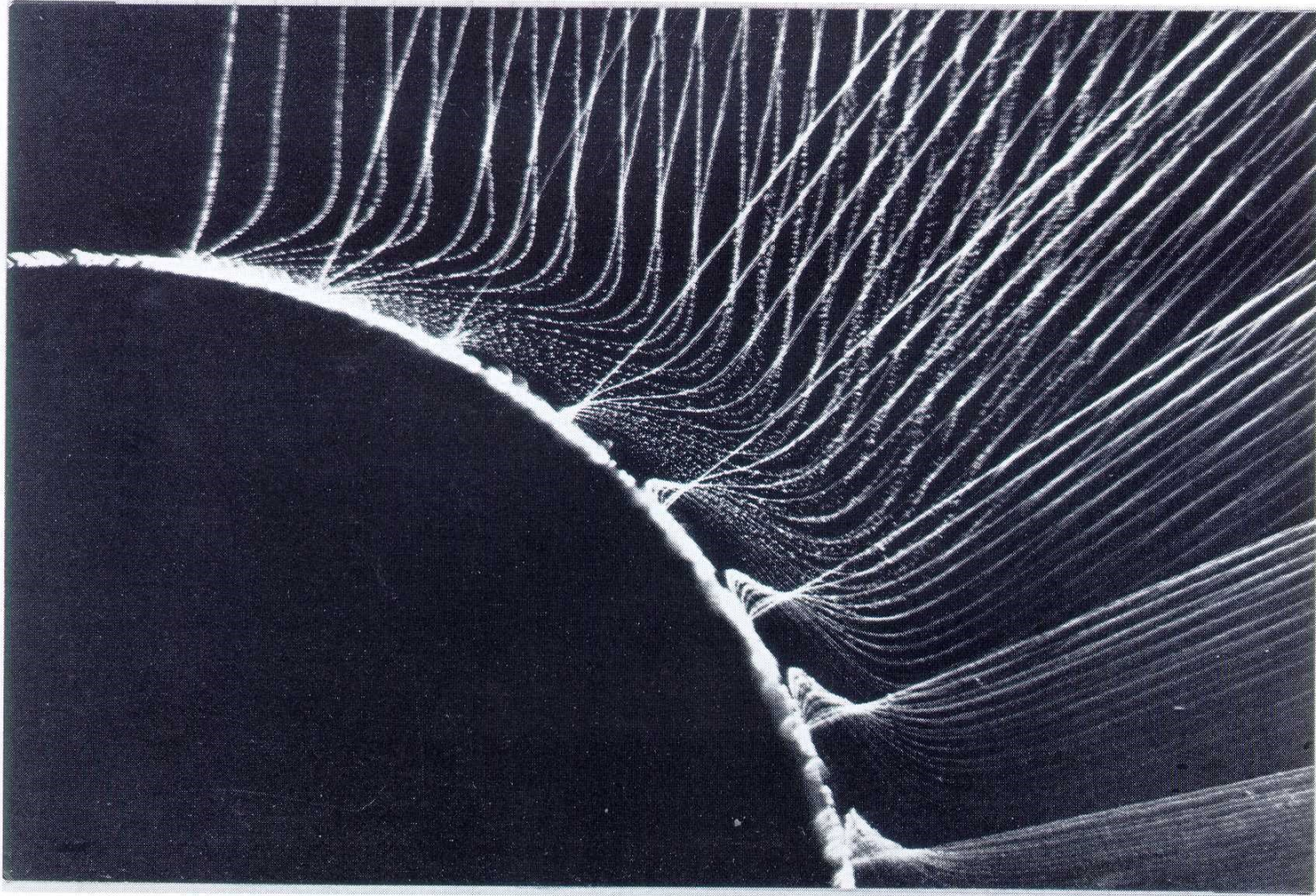


Fig. 22. Water, velocity of motion 2 cm/s, cylinder diameter 70 mm, photographed two seconds after the start of motion,  $Re = 1.2 \times 10^3$ , hydrogen bubble method.



# *Campos de Velocidades*

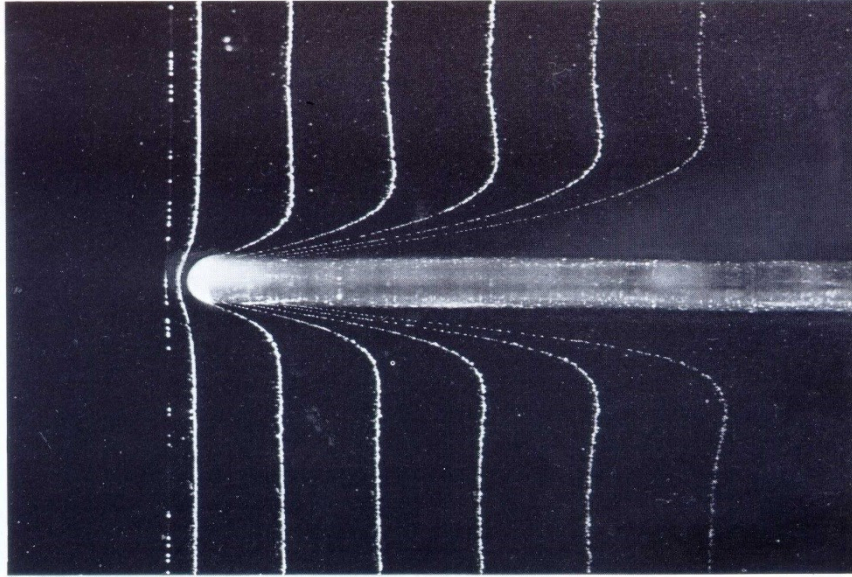
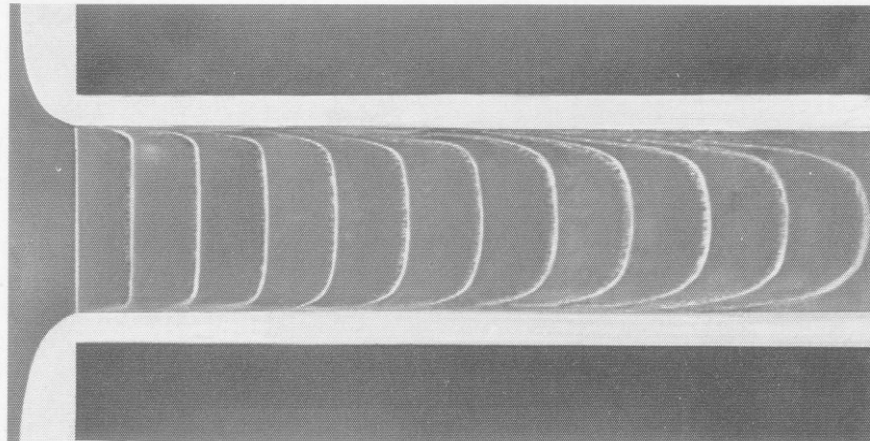


Fig. 20. Development of laminar boundary layer (0.01% salt water, free stream velocity 0.1 cm/s, thickness of the plate 0.5 mm, hydrogen bubble method)

Escoamentos externos não são confinados por paredes .

Escoamentos internos possuem fronteiras que limitam ou restringem o campo de escoamento



# *Campos de Velocidades*

Soluções continuidade e QDM

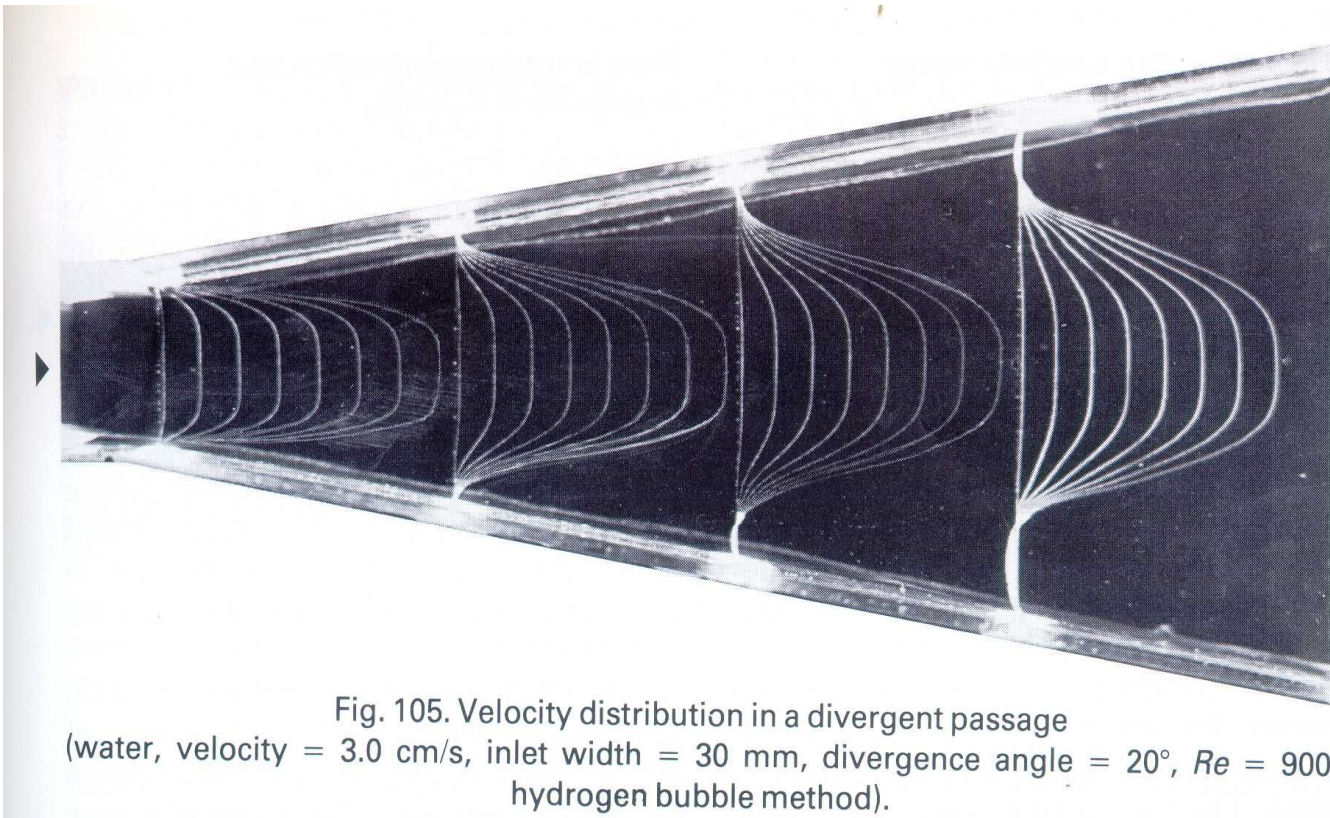


Fig. 105. Velocity distribution in a divergent passage  
(water, velocity = 3.0 cm/s, inlet width = 30 mm, divergence angle = 20°,  $Re = 900$ ,  
hydrogen bubble method).