8. Airglider

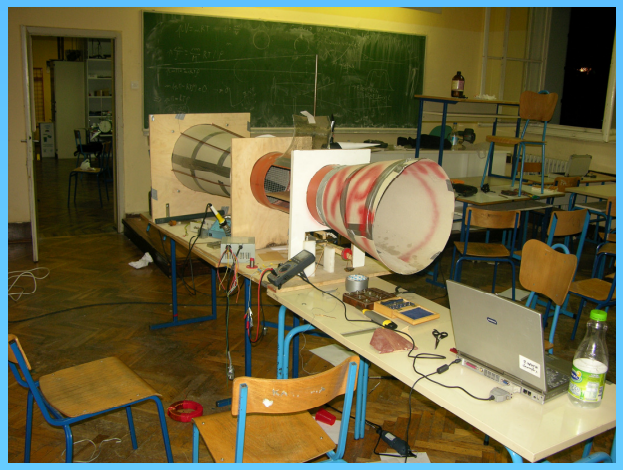
Problem

Measurement

Two different parts :

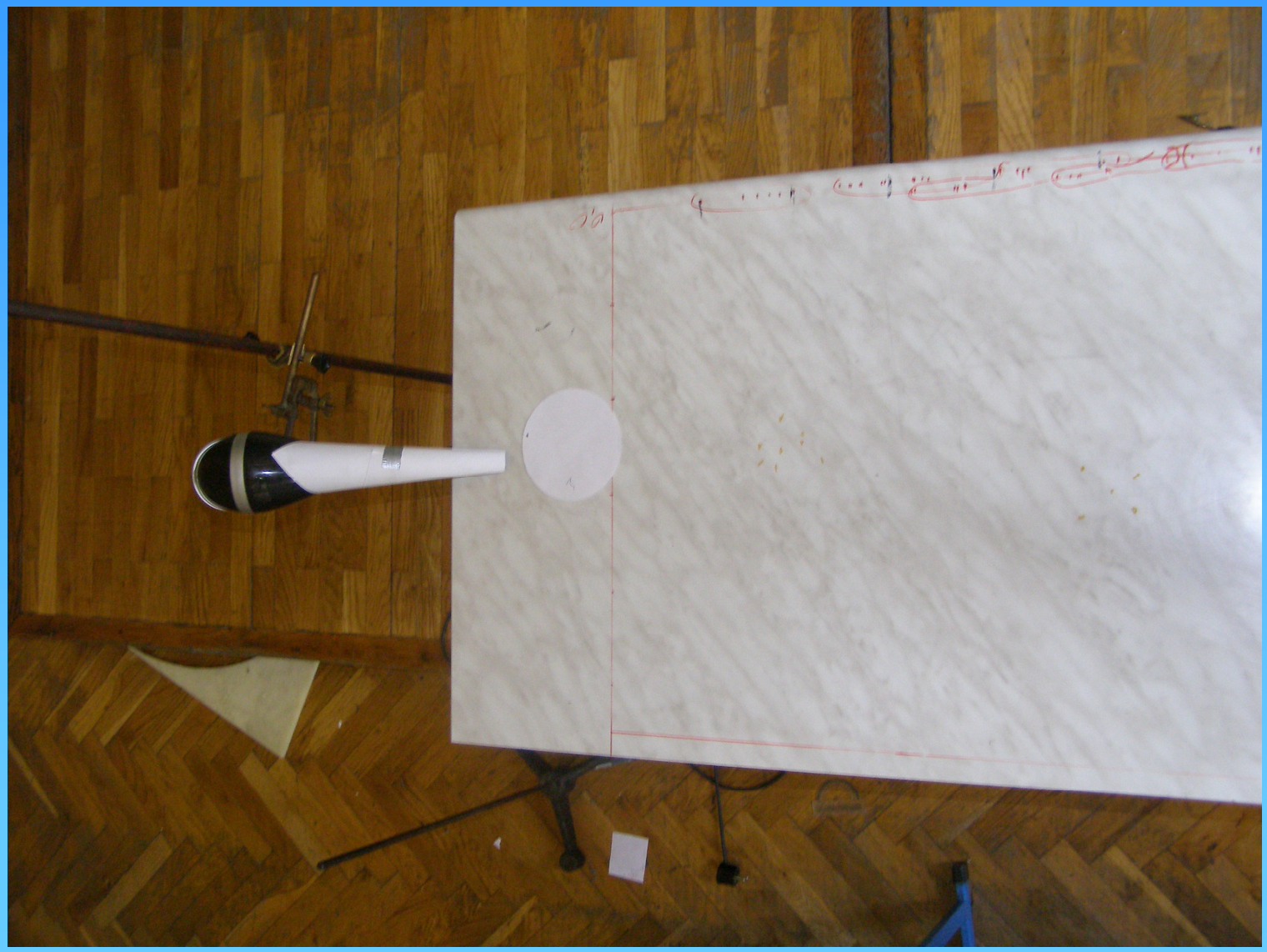
- Real movement observation
  - Flight analysis
  - Parameters varied
    - Glider area
    - Blowing velocity
    - Blowing angle



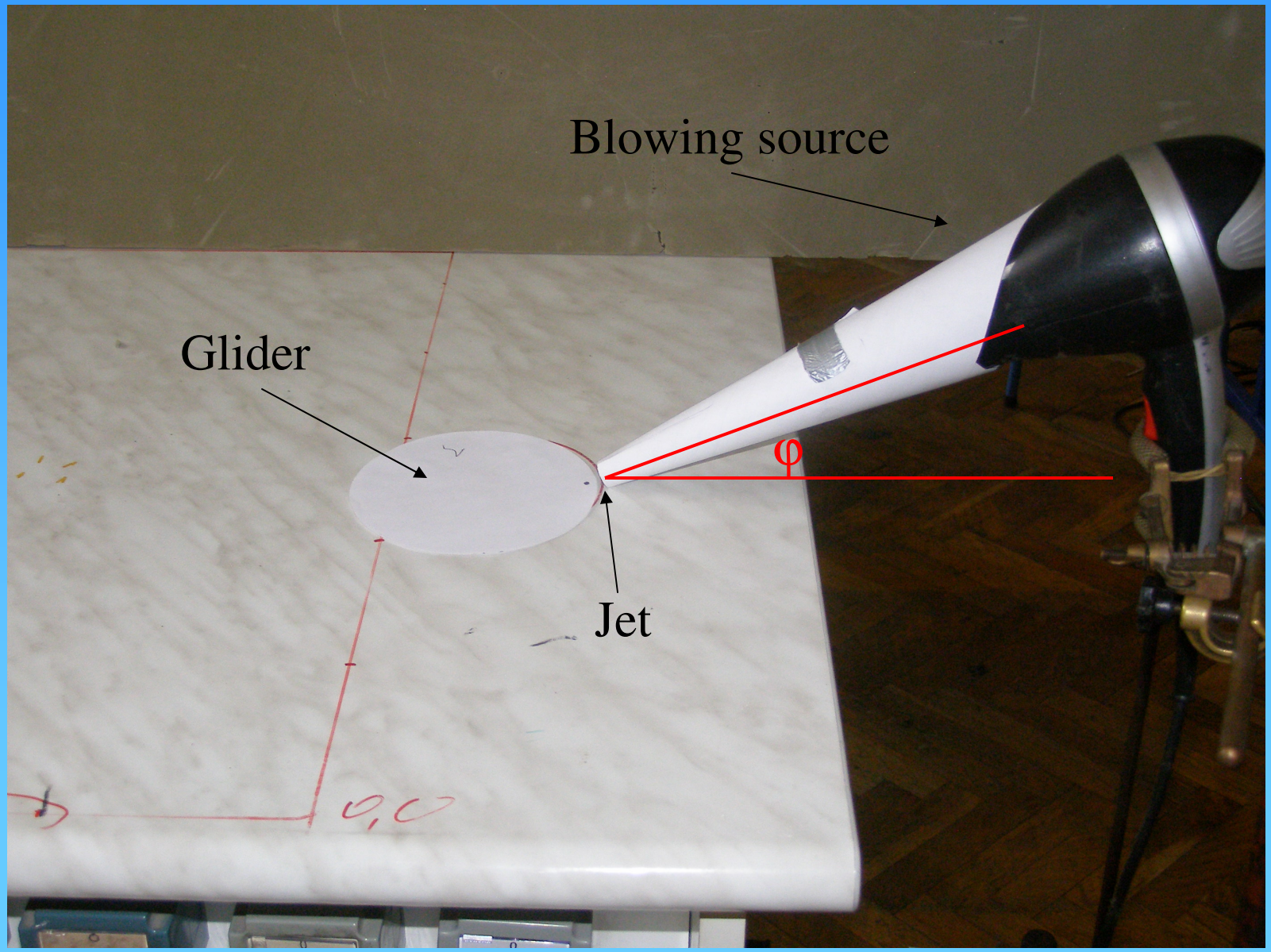


- Wind tunnel measurements
  - Force measurement
  - Parameters varied
    - Angle of attack
    - Air velocity
    - Glider height

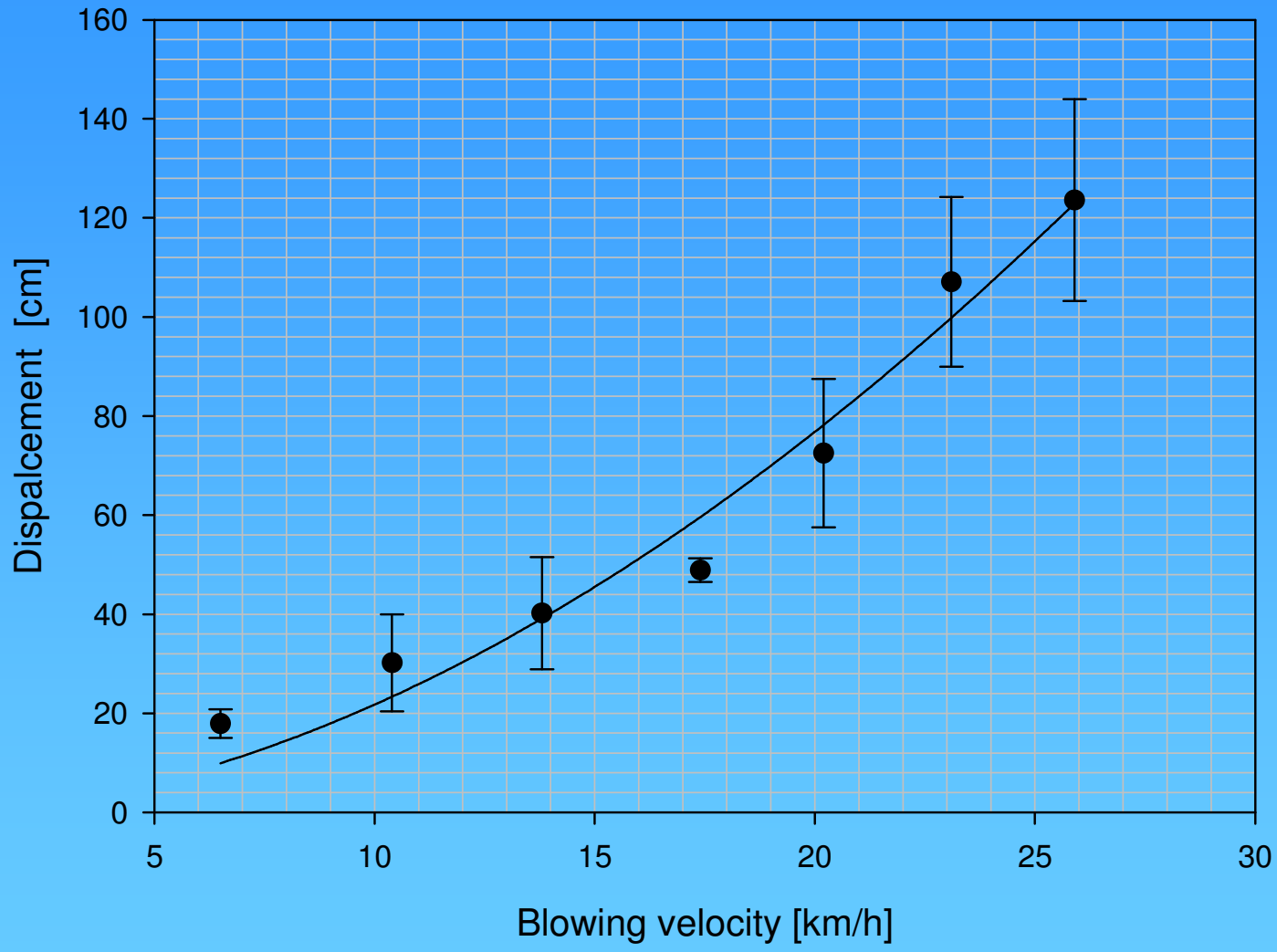
Real movement Measurement



Blowing angle variation

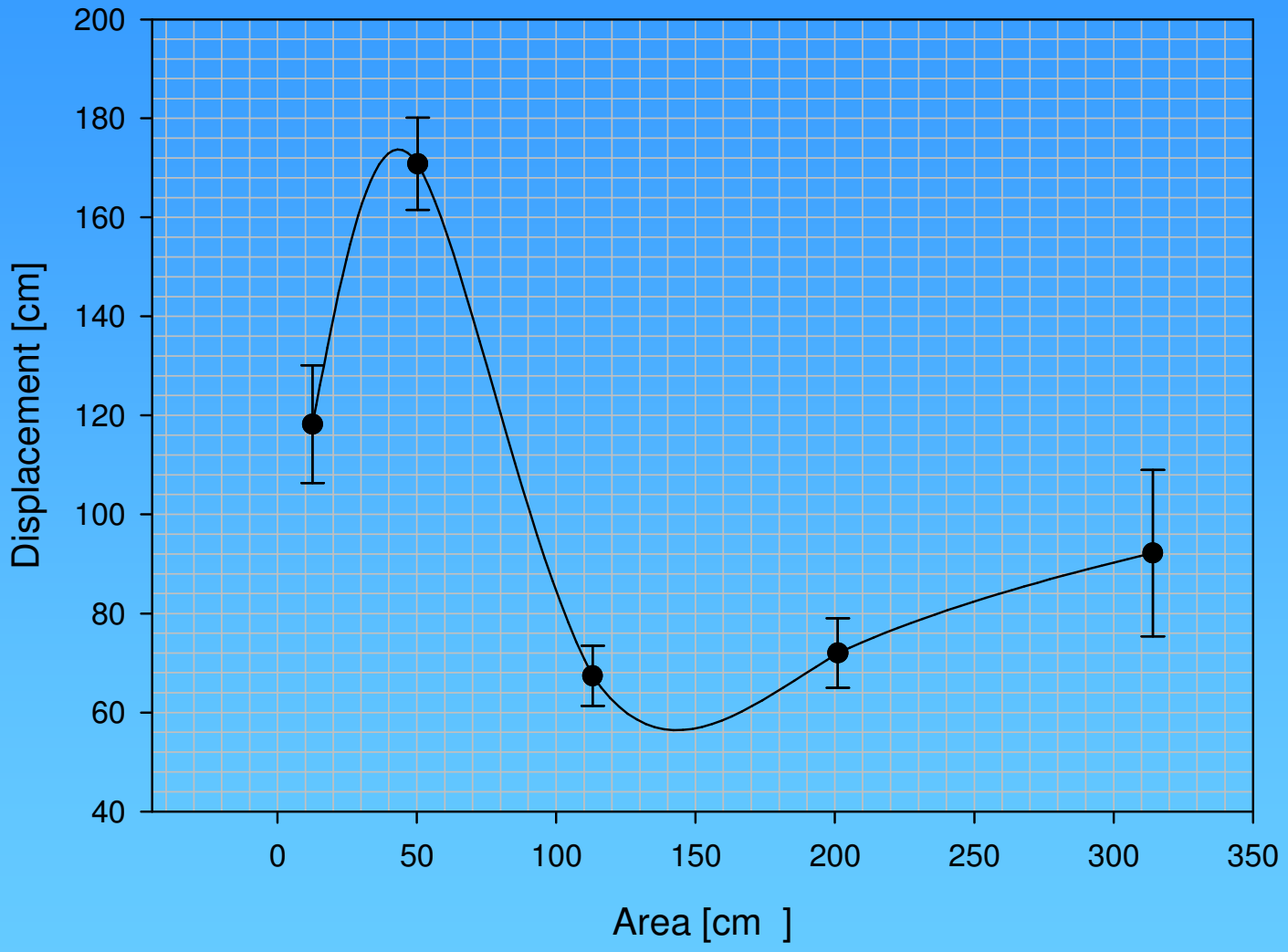


Displacement vs blowing velocity



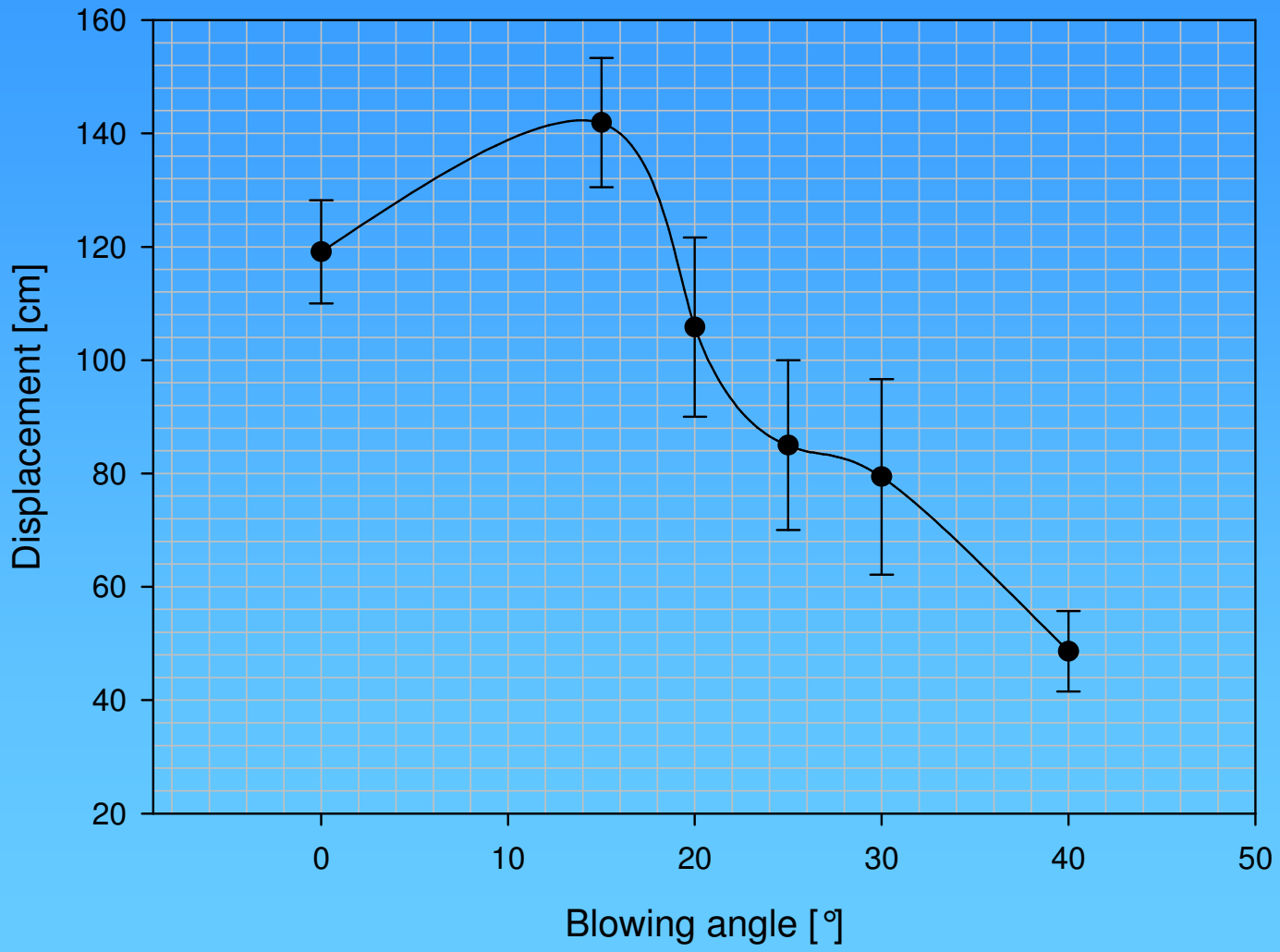
- Quadratic fit - due to drag

Displacement vs glider area



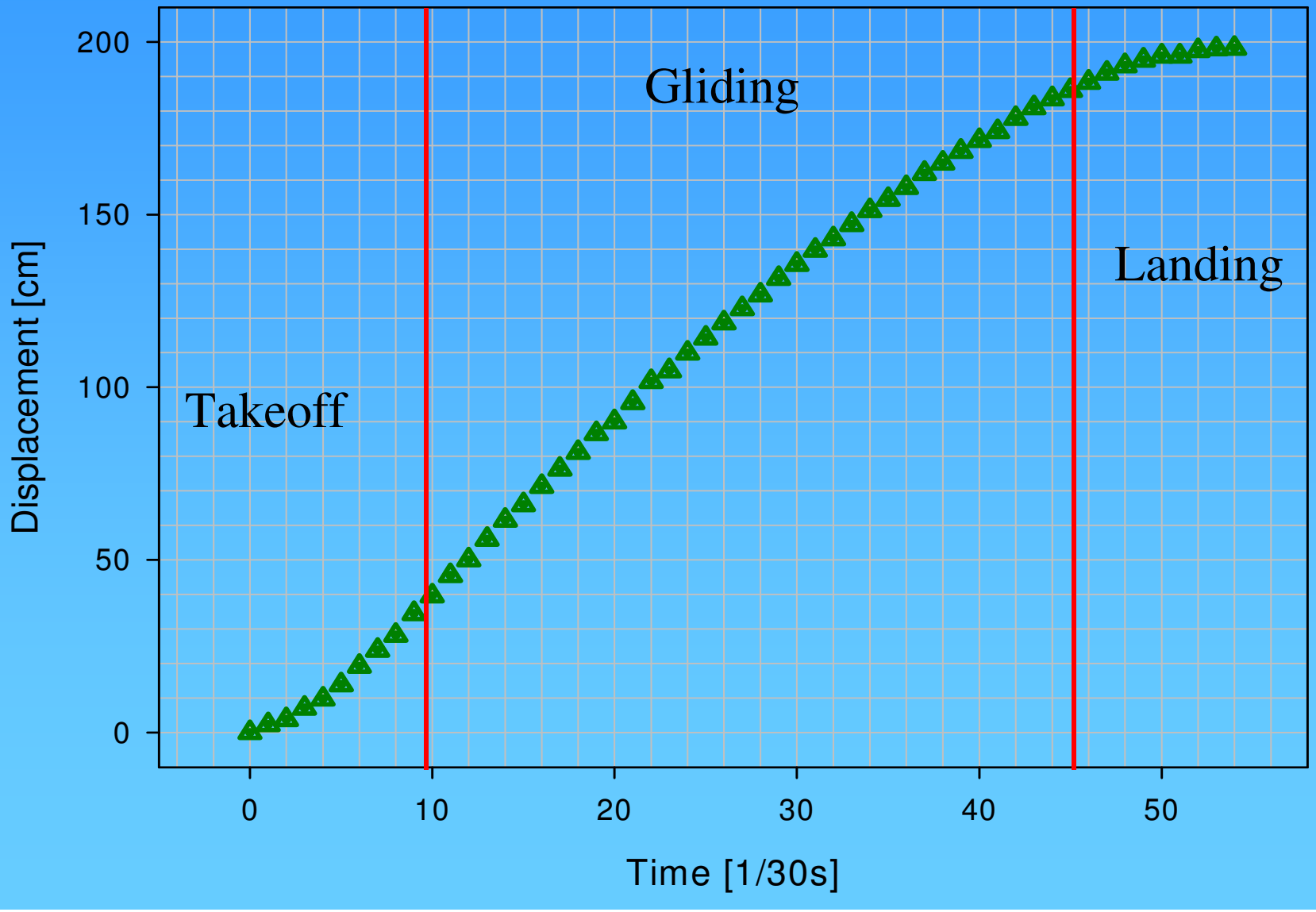
- Maximum at 50cm^2 - optimal Drag ratio

Displacement vs blowing angle

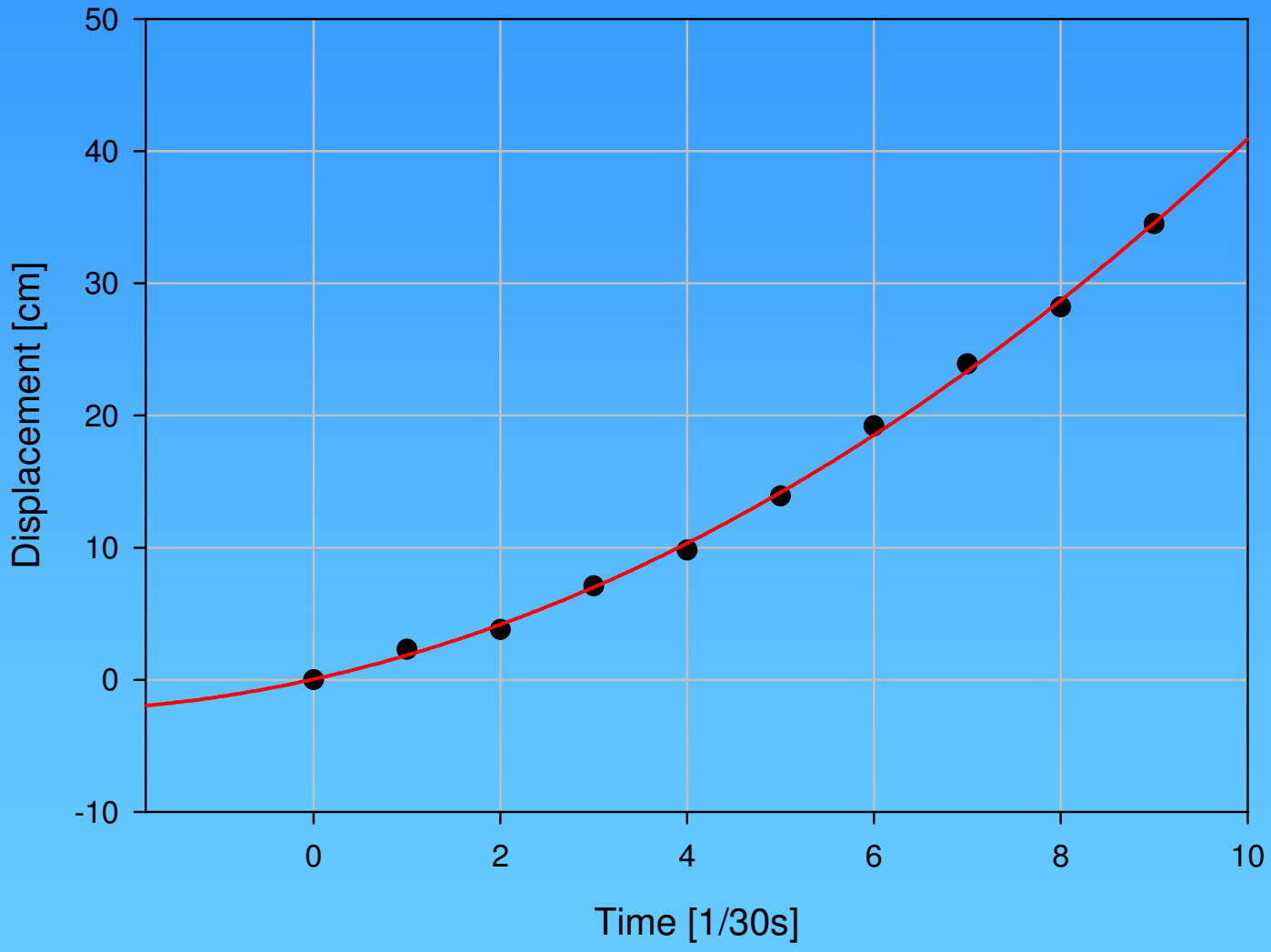


- Maximum at 15°

Flight phases

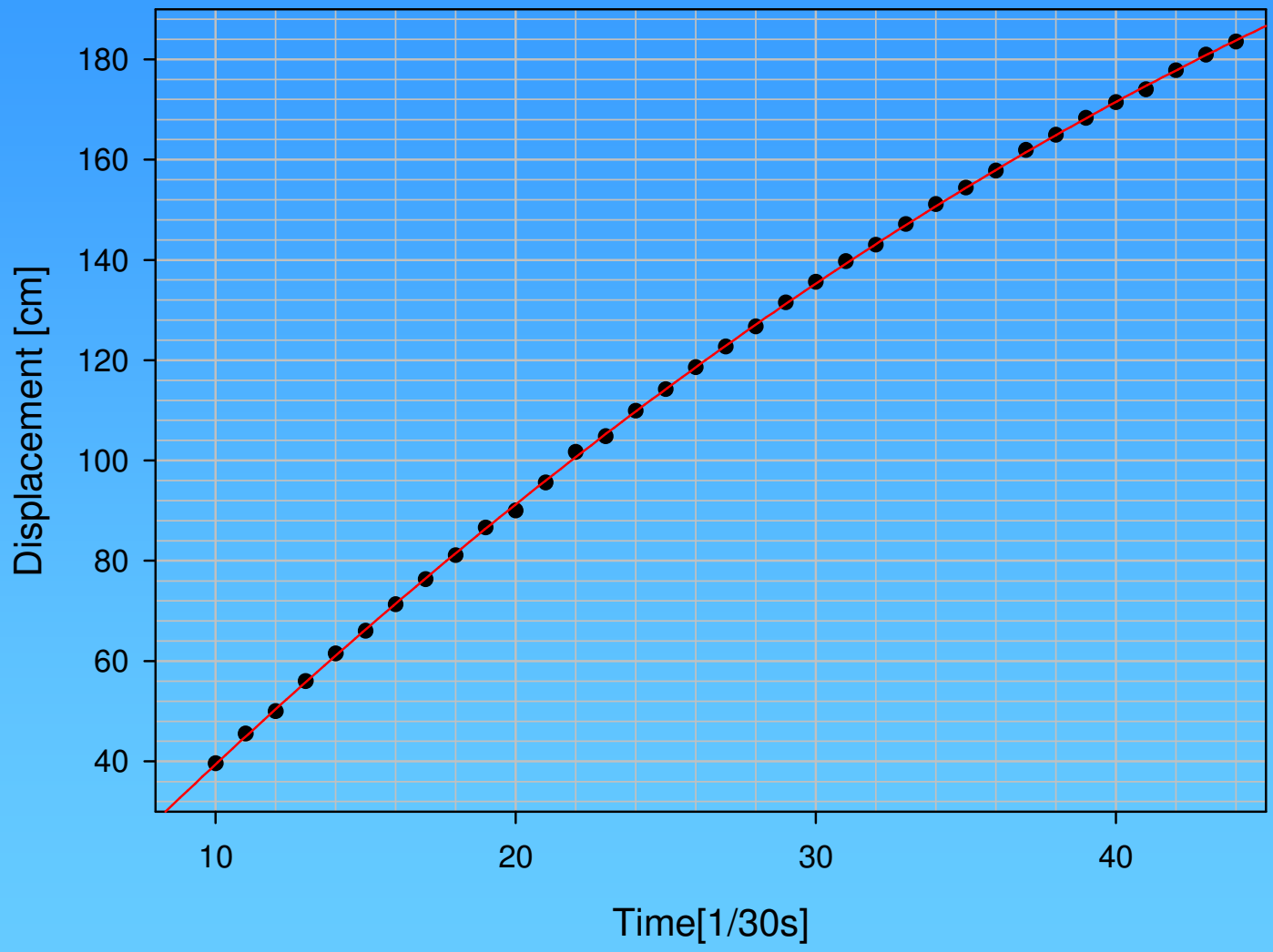


Takeoff - acceleration



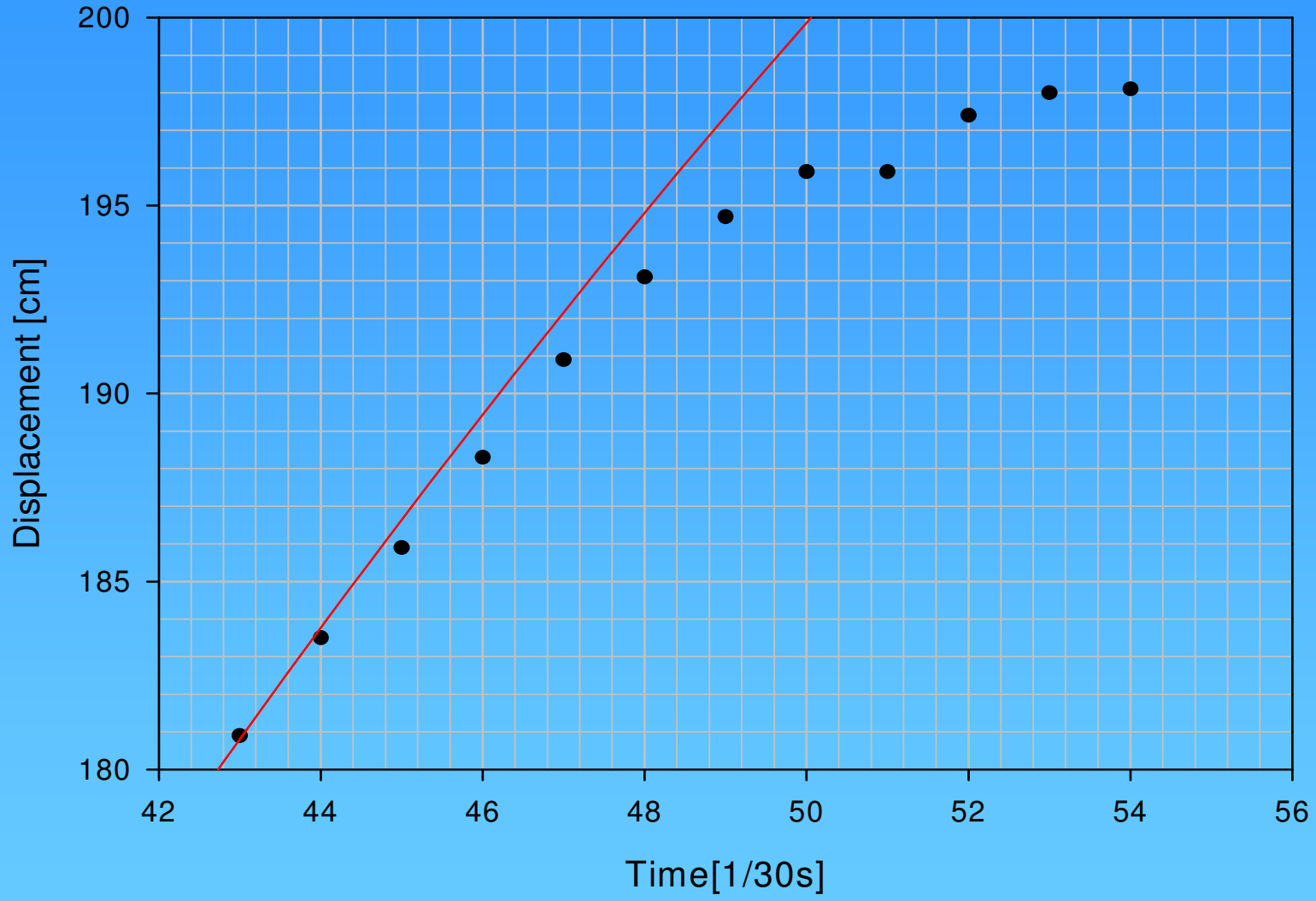
- Quadratic fit - uniform acceleration

Gliding - deceleration



- Quadratic fit - uniform deceleration

Landing

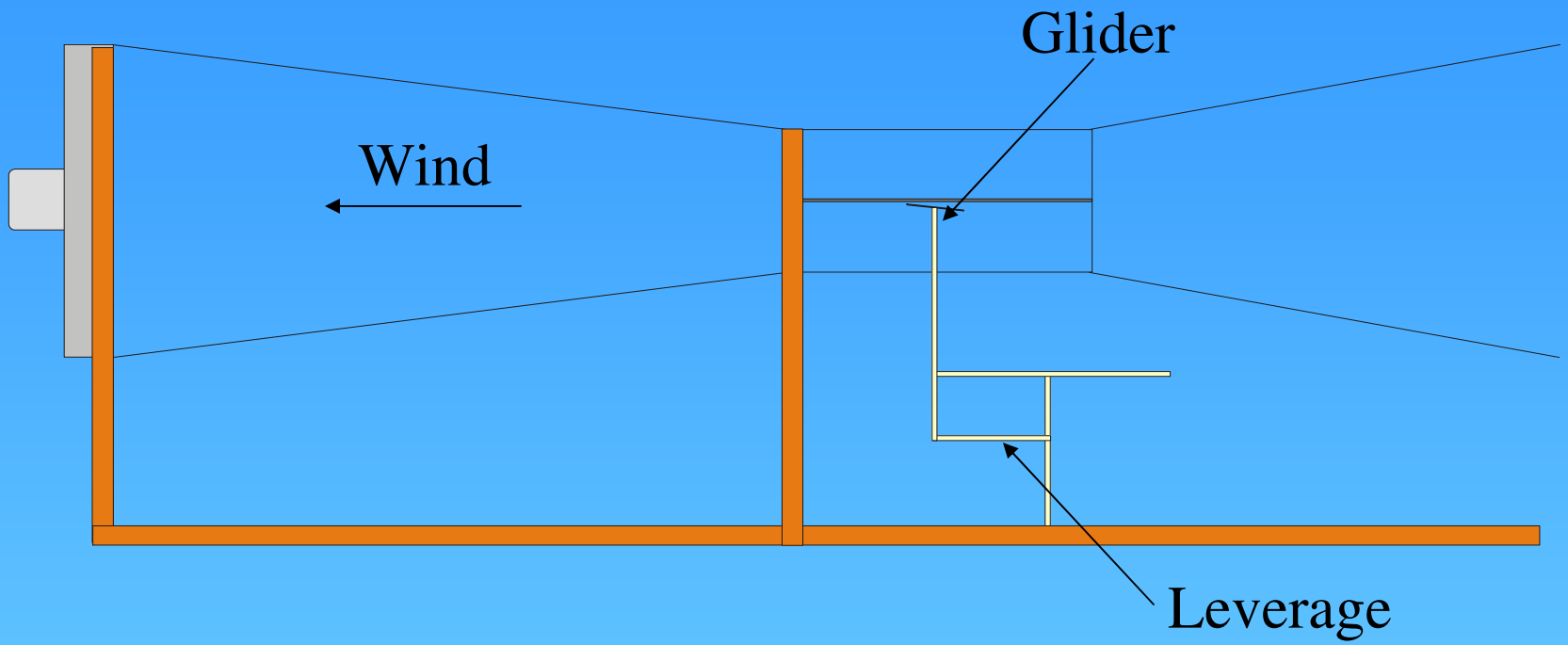


- Disagreement - non uniform deceleration

Wind tunnel Measurement

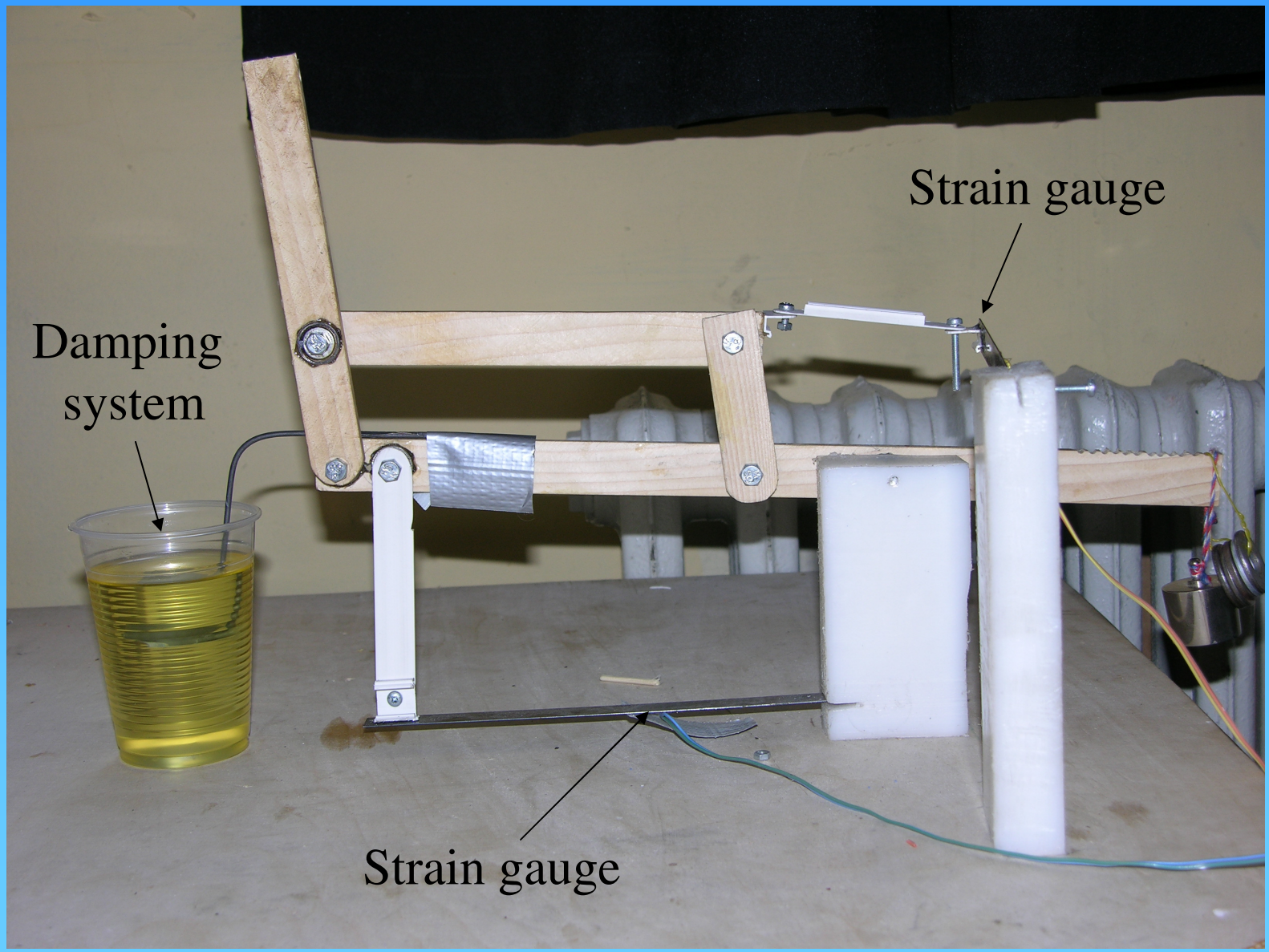


Wind tunnel characteristics

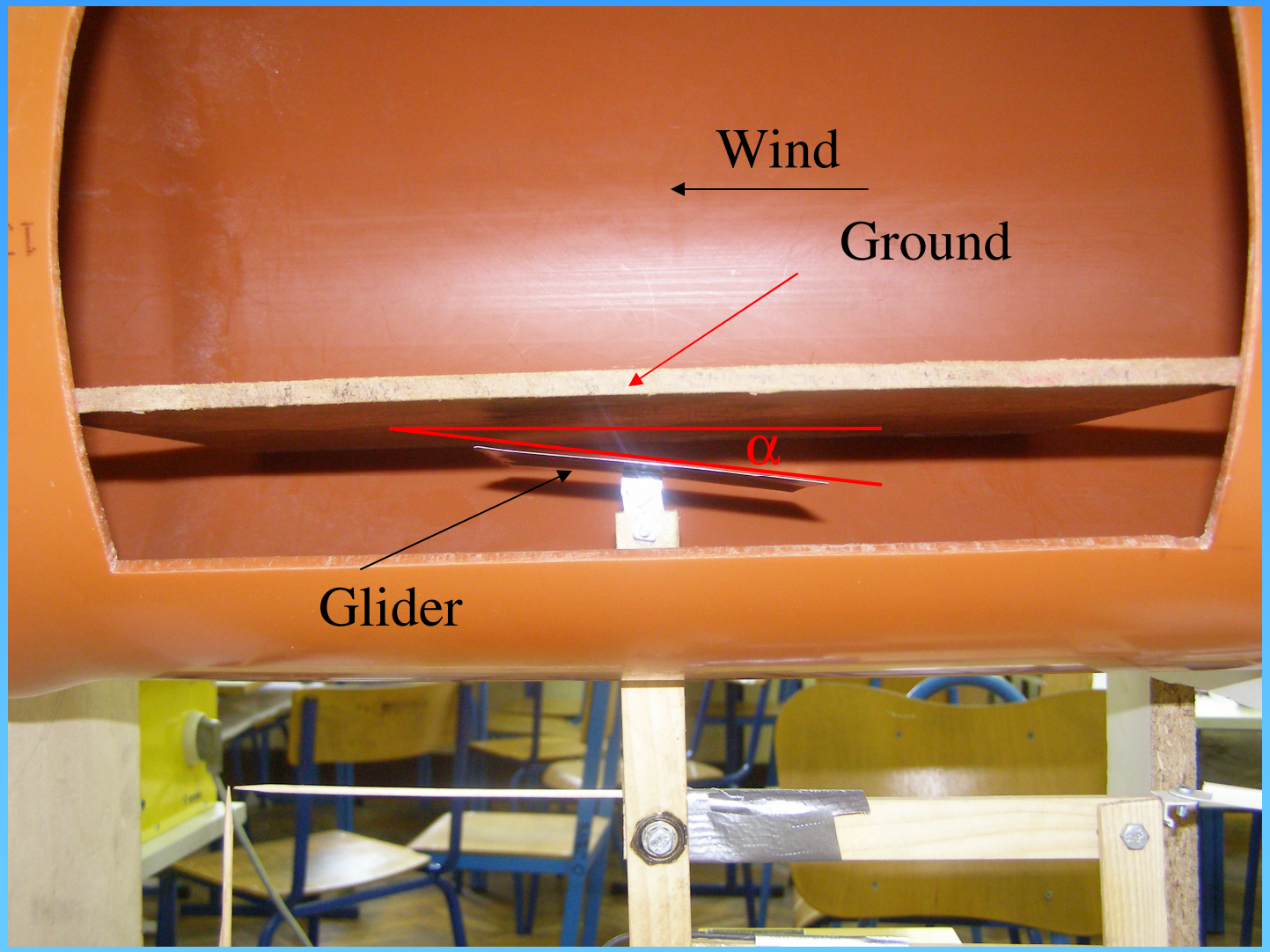


- Tunnel properties :
  - Velocity span : 0 to 45km/h
  - Force measurement straingauge/weights
  - Measurement sensitivity 10^{-4}N
  - Measuring section cylindrical (radius 250mm)

Force measurement system

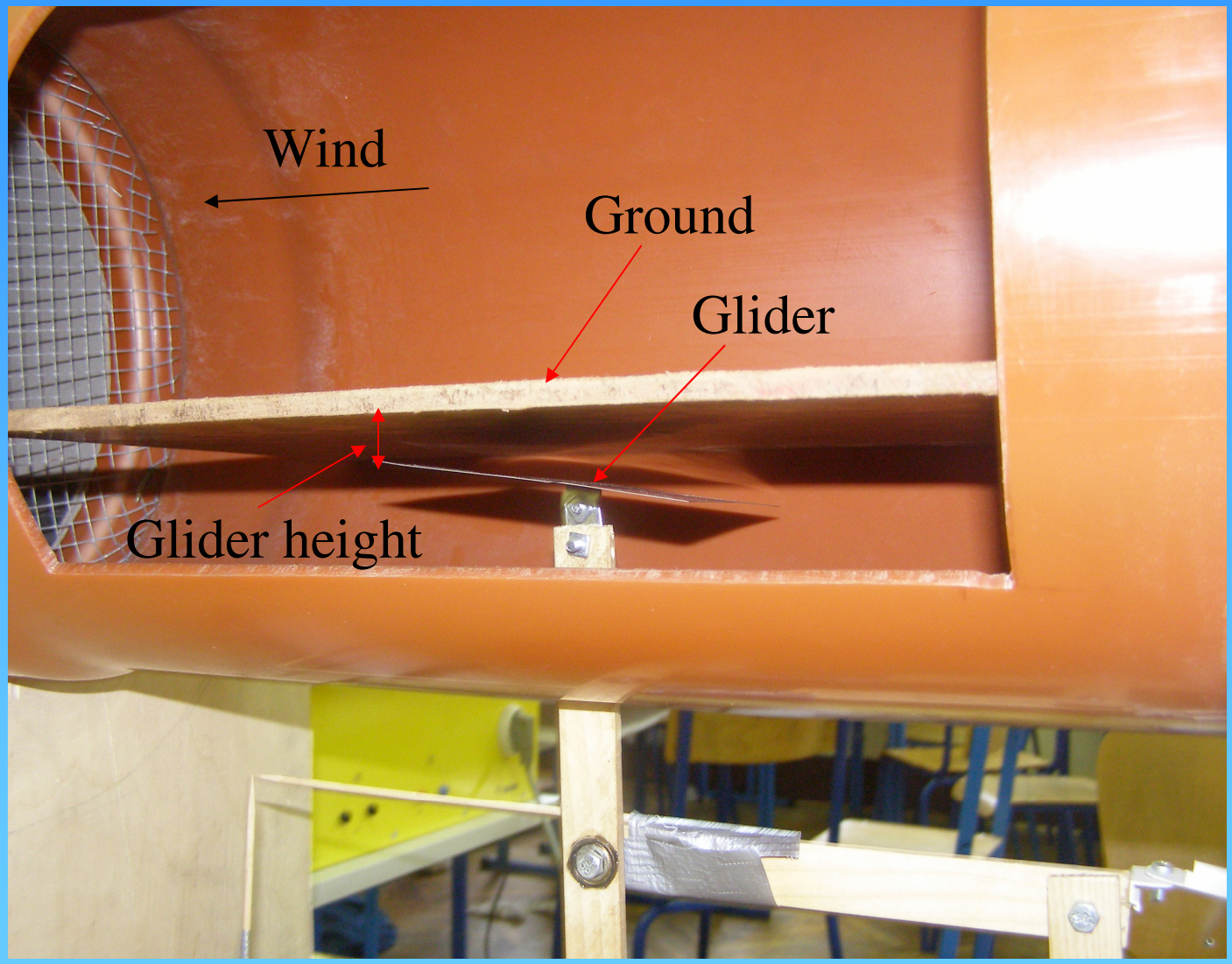


Angle of attack variation



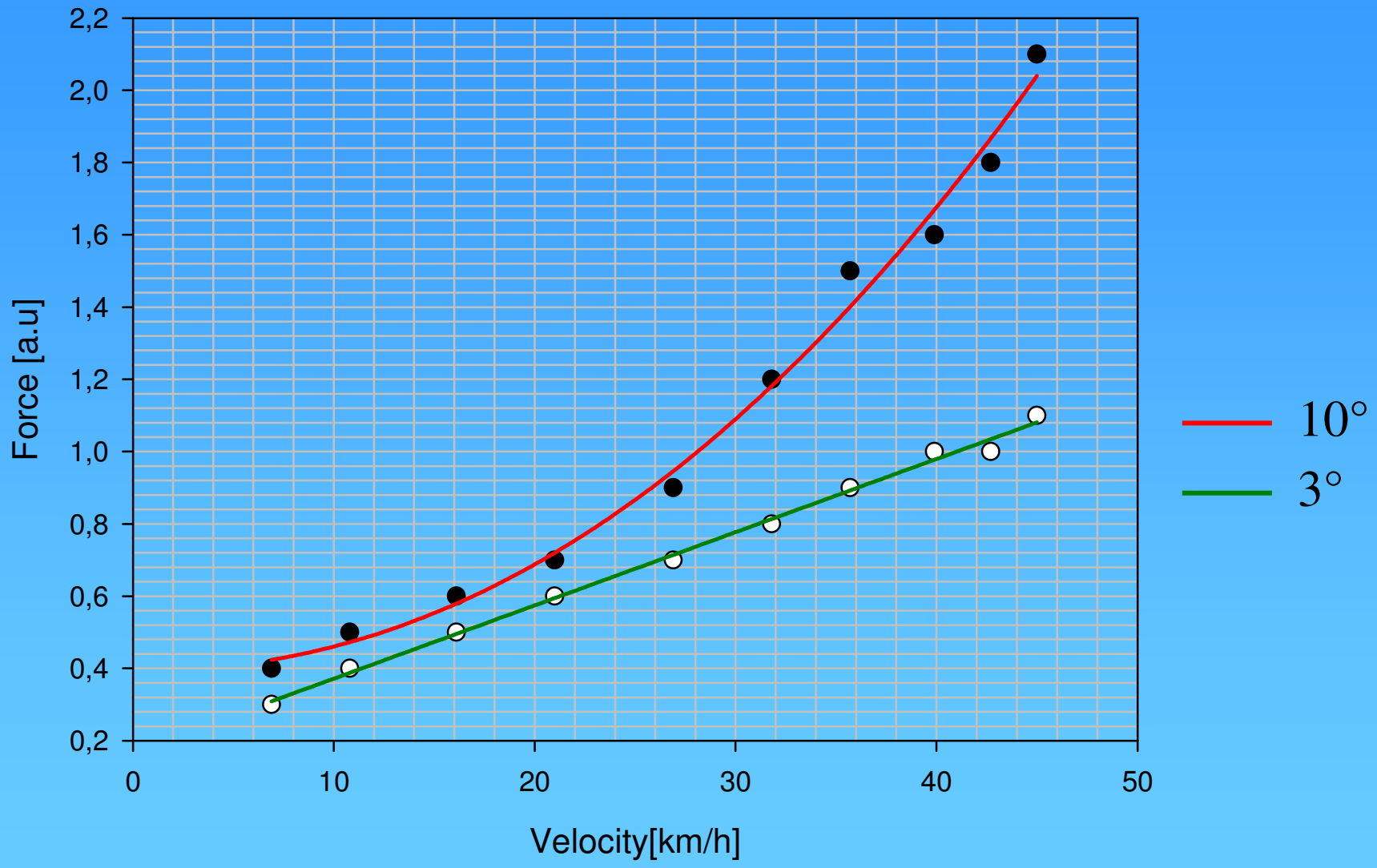
- Glider height remains constant

Glider height variation



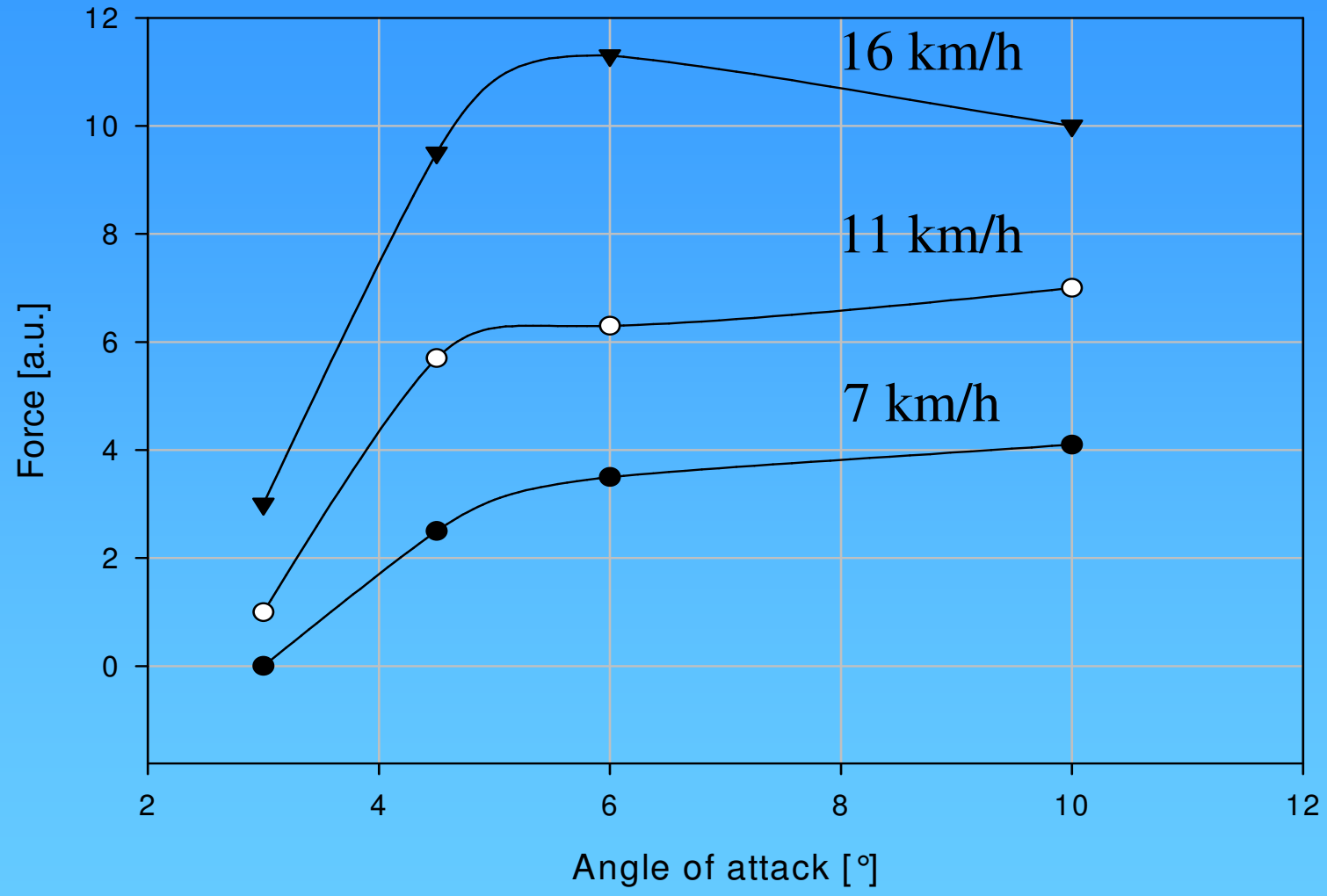
- Angle of attack remains constant

Dependence of drag on velocity



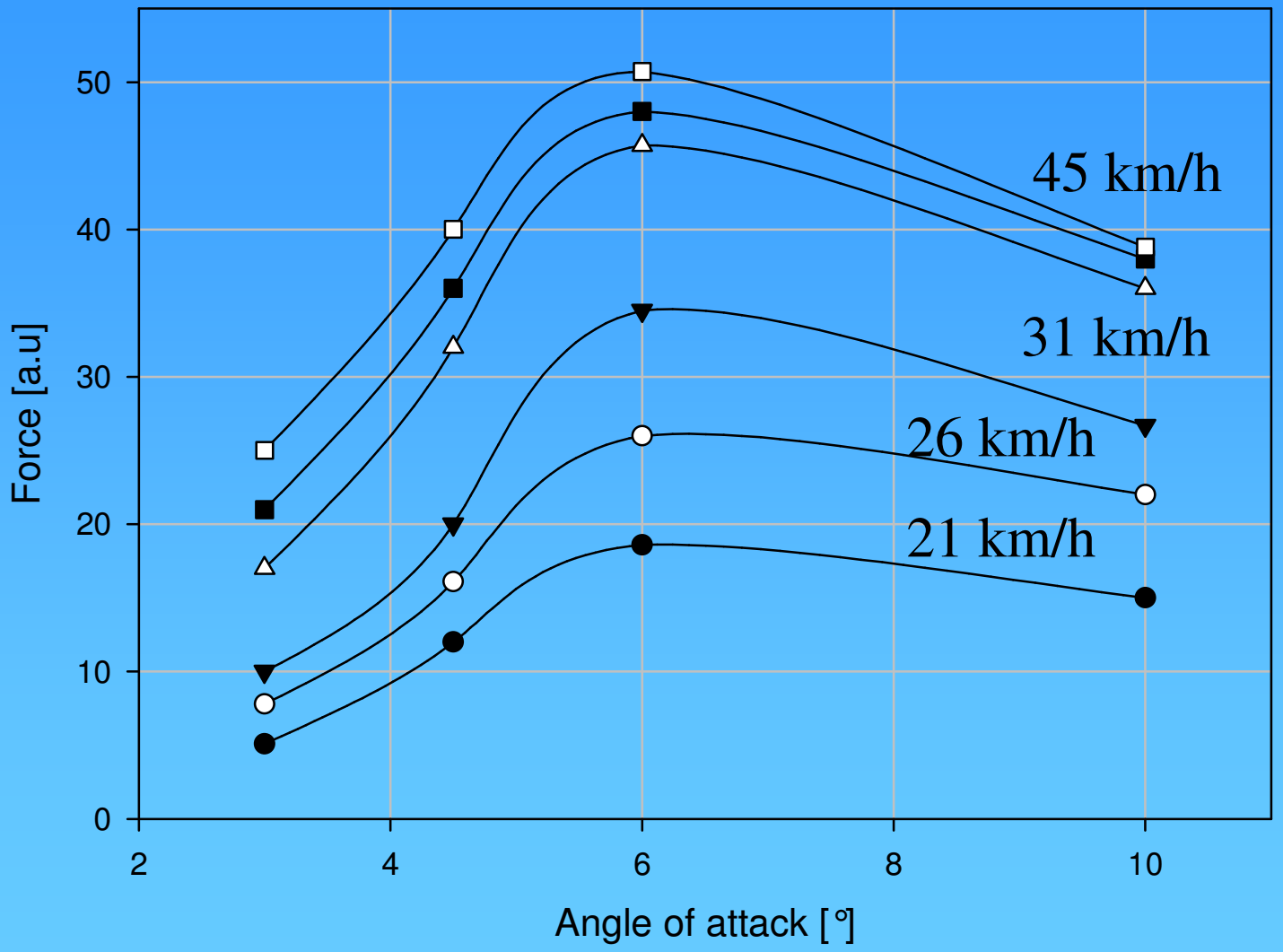
- Linear for small angles of attack

Lift analysis: low velocity



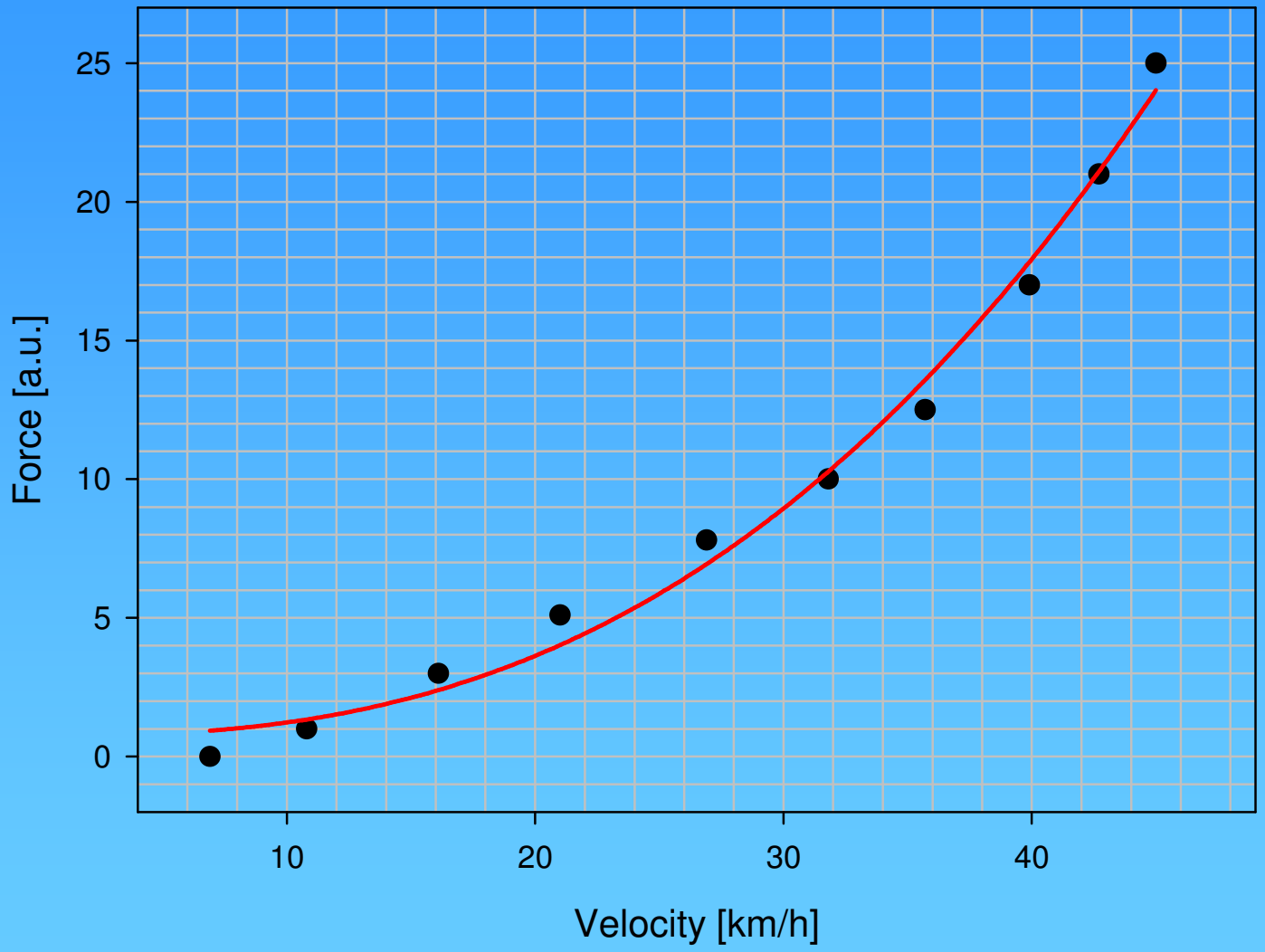
- Increasing with angle of attack for small velocities

Lift analysis: high velocity



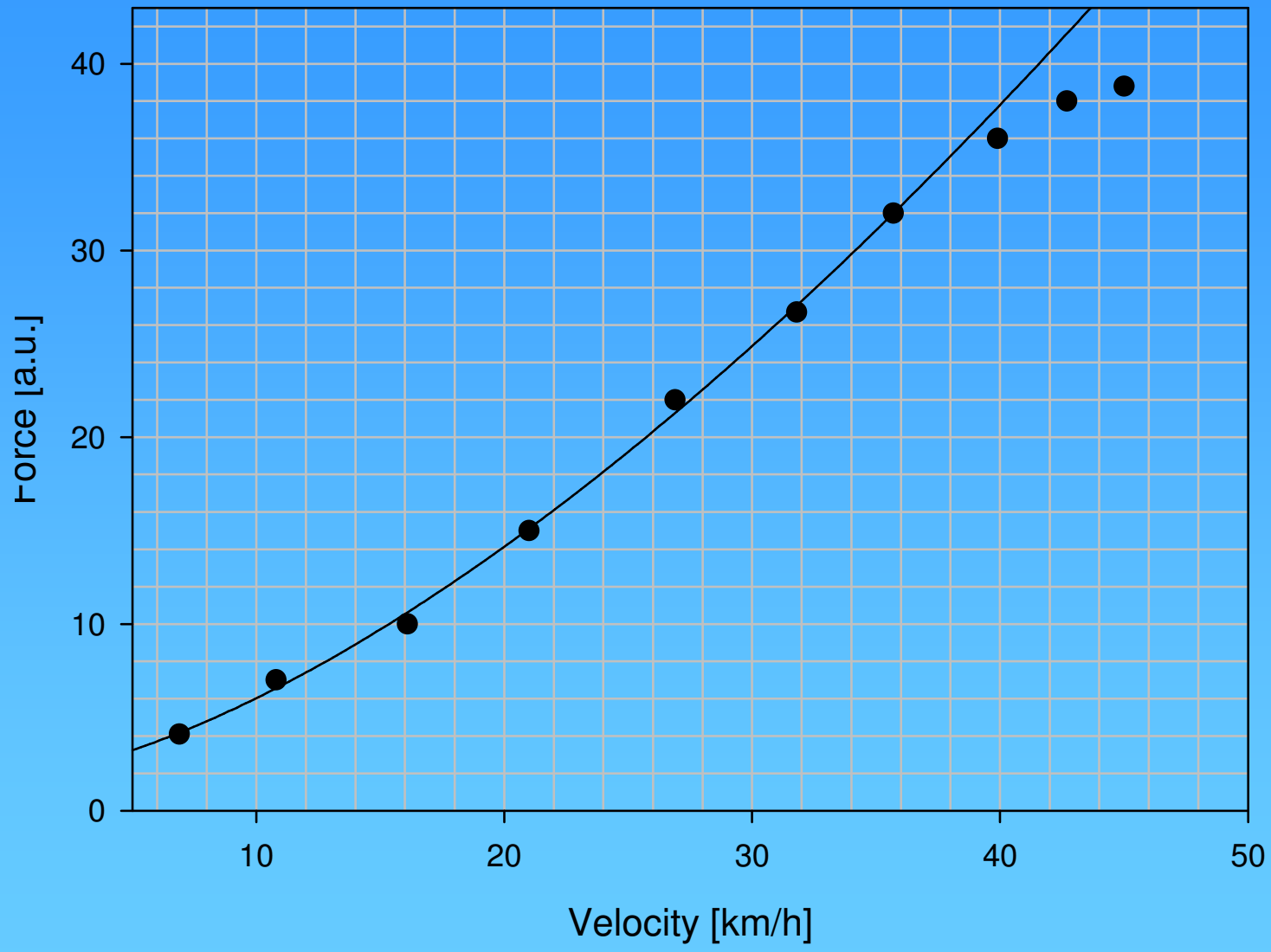
- Maximum due to boundary layer separation

Lift vs velocity: low angle of attack



- Quadratic fit - for angle of attack 3°

Lift vs velocity: high angle of attack



- Disagreement due to separation - for angle of attack 10°