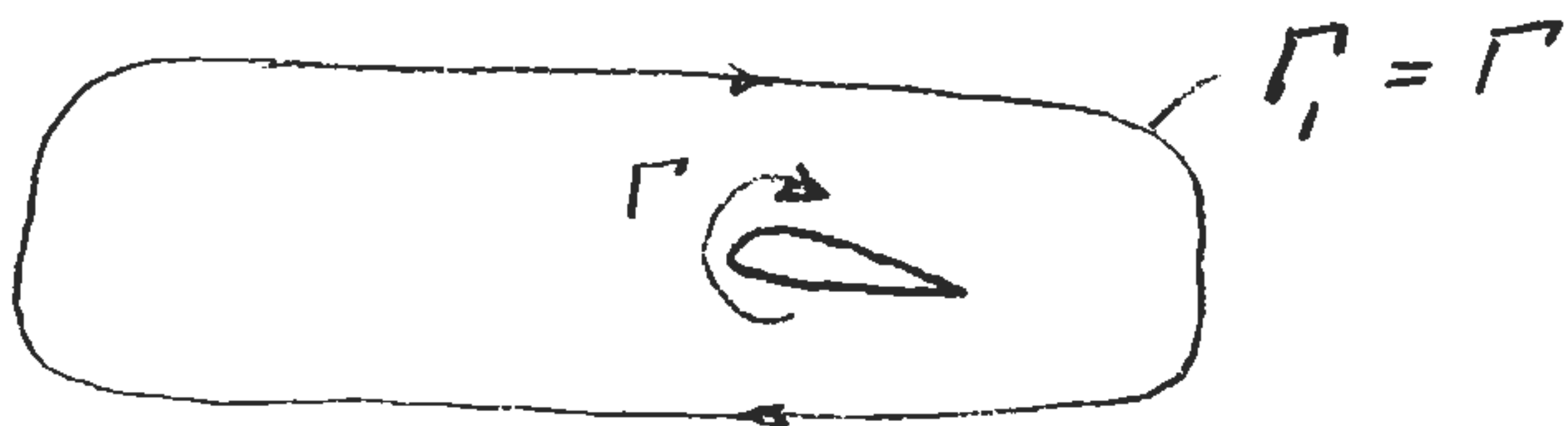
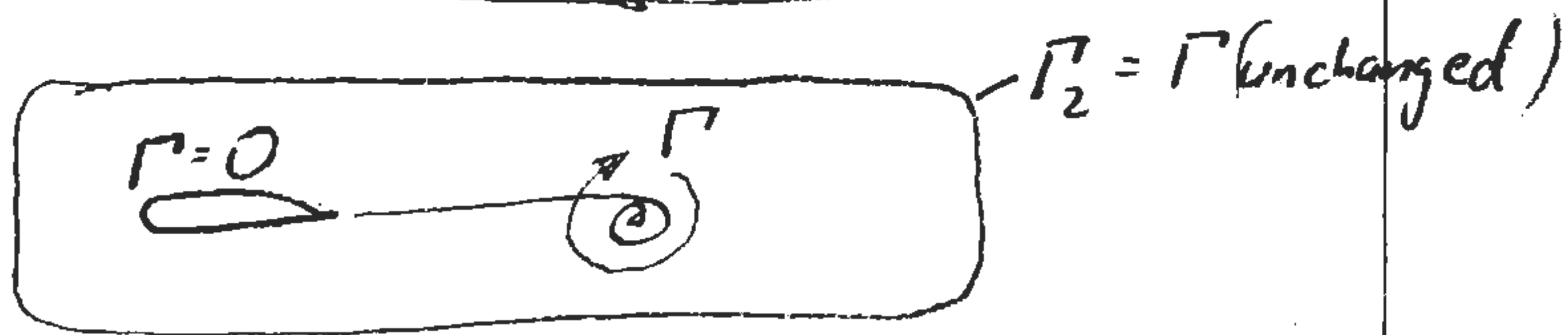


F1a. Before touchdown:



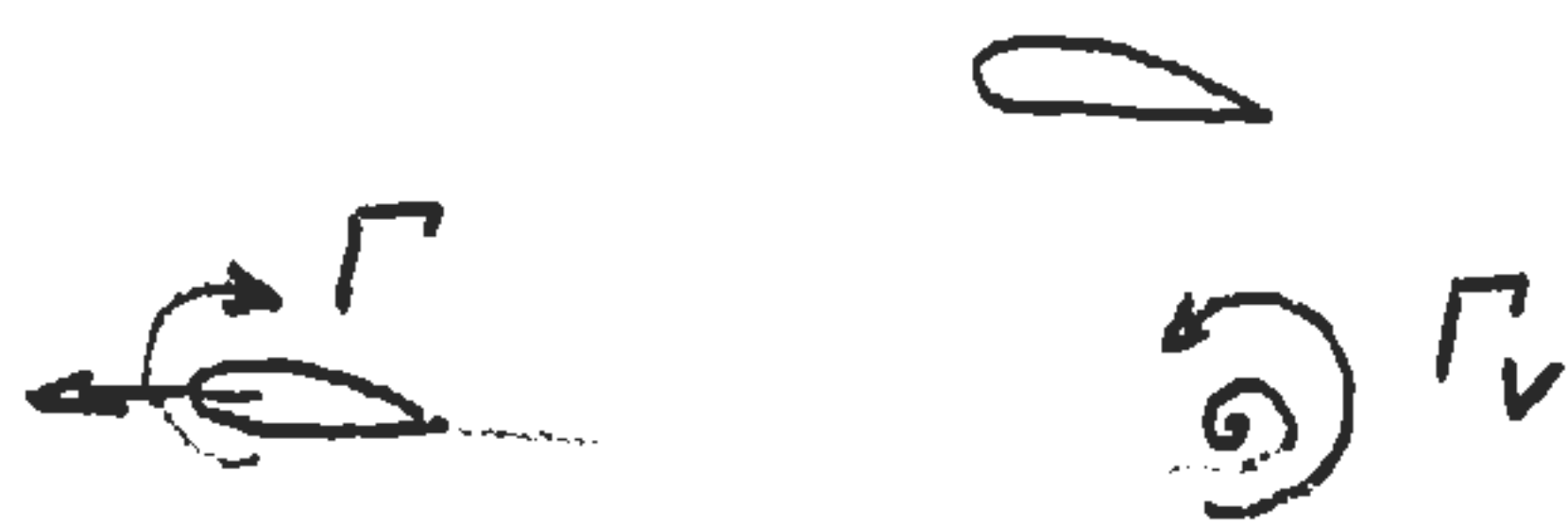
After touchdown:



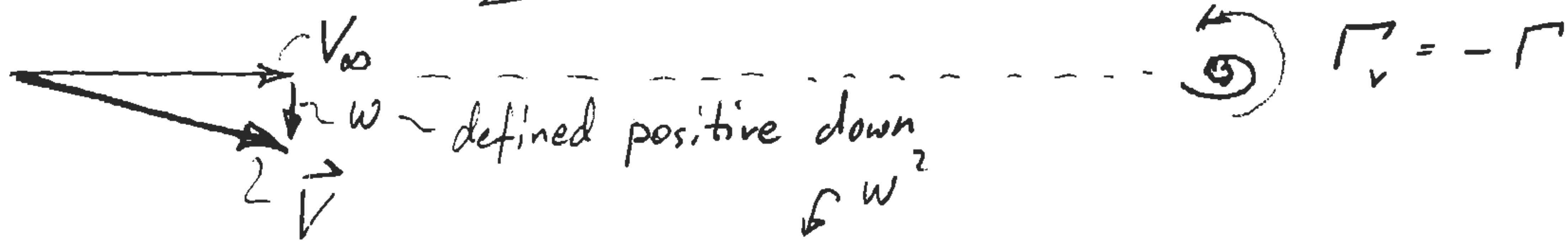
Airfoil sheds a vortex which contains all the airfoil's initial circulation.  
Airfoil is left with zero circulation.

F1b. Since initial circulation is zero,

must have  $\Gamma_v = -\Gamma$



Velocity seen by airfoil



$$w = \frac{\Gamma}{2\pi d}, \quad |\vec{V}|^2 = V_\infty^2 + \left(\frac{\Gamma}{2\pi d}\right)^2 \approx V_\infty^2 \text{ if } w \ll V_\infty$$

Net lift force/span is perpendicular to apparent velocity.

$$F' = \rho |\vec{V}| \Gamma \approx \rho V_\infty \Gamma$$



Take components  $\perp$  and  $\parallel$  to  $\vec{V}_\infty$

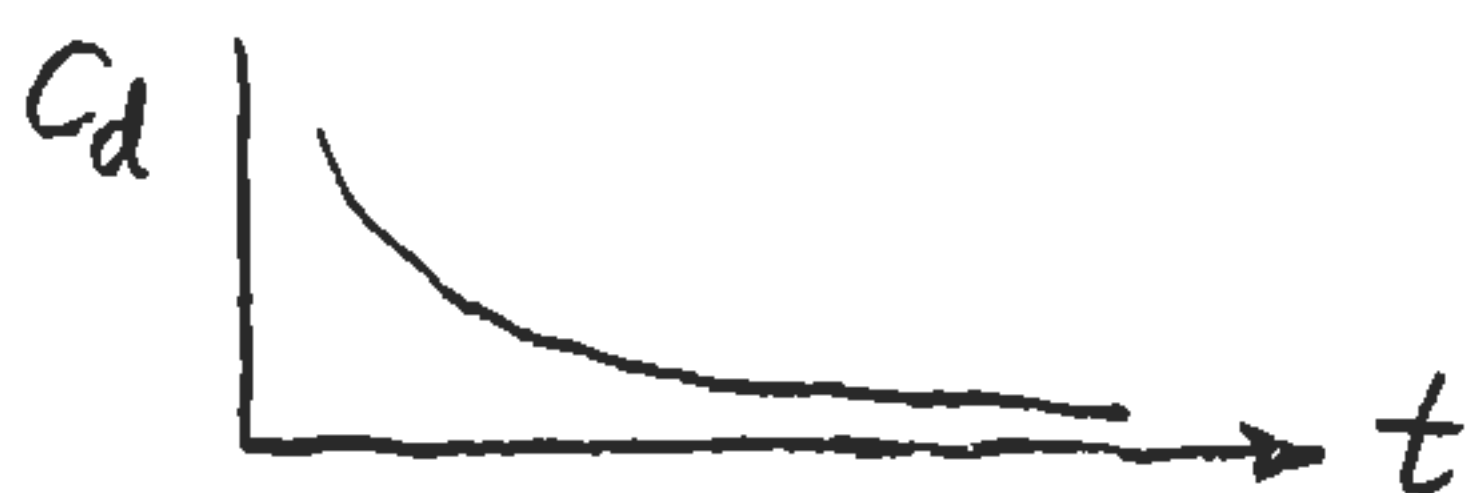
$$L' = F' \frac{V_\infty}{|\vec{V}|} \approx F' = \rho V_\infty \Gamma \rightarrow C_l = \frac{L'}{\frac{1}{2} \rho V_\infty^2 c} = \frac{2\Gamma}{c V_\infty}$$

$$D' = F' \frac{w}{|\vec{V}|} \approx F' \frac{w}{V_\infty} = \rho w \Gamma \rightarrow C_d = \frac{D'}{\frac{1}{2} \rho V_\infty^2 c} = \frac{2\Gamma w}{c V_\infty V_\infty} = C_l \frac{w}{V_\infty}$$

since  $w \sim \frac{1}{d} \sim \frac{1}{\text{time}}$

$C_d$  decreases as  $\frac{1}{\text{time}}$

$$\text{or } C_d = \frac{2\Gamma}{c V_\infty} \cdot \frac{\Gamma}{2\pi d V_\infty} = \frac{1}{4\pi} \frac{c}{d} C_l^2$$



13-782  
42-581  
42-980  
42-989  
42-992  
42-999  
500 SHEETS FILLER 5 SQUARE  
50 SHEETS EYE-EASE 5 SQUARE  
100 SHEETS EYE-EASE 5 SQUARE  
200 SHEETS EYE-EASE 5 SQUARE  
100 RECYCLED WHITE 5 SQUARE  
200 RECYCLED WHITE 5 SQUARE  
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