Consider an ideal poweroff glide with a finite wind speed, and the following assumptions:

- The algebraic sum of external forces and torques are 0.
- The wind speed is parallel to the horizontal rule.
- The weight W, the lift coefficient C_L, the zero-lift drag coefficient C_{D_0}, and the drag-due-to-lift factor k, are all constants (which implies the drag coefficient C_D is a constant as well).

And the free body diagram is shown as Figure 1.

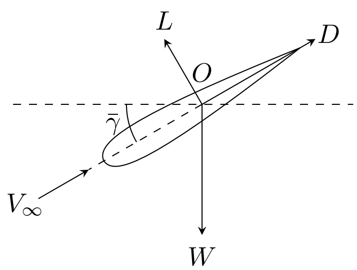

Figure 1: The free body diagram of a poweroff glide

Also, the relations between speeds are given in Figure 2, note that a positive V_{wind} represents a tailwind.

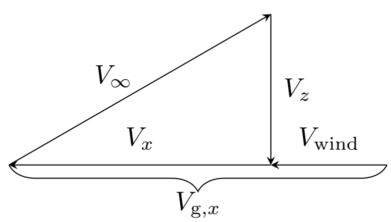

Figure 2: The relations between speeds

Then we have

$$
\begin{aligned}
V_x &= V_\infty \cos\bar{\gamma} = V_\infty \frac{L}{W},\\
V_z &= V_\infty \sin\bar{\gamma} = V_\infty \frac{D}{W}.
\end{aligned}
$$

And by definition, the endurance E is

$$
E = \frac{H}{V_z} = \frac{H}{V_\infty \frac{D}{W}} = \frac{HW}{V_\infty D},
$$

and the range R is

$$
\begin{aligned}
R = EV_{\text{g},x} &= \frac{HW}{V_\infty D} V_{\text{g},x}\\
&= \frac{HW}{D} \frac{V_{\text{g},x}}{(V_{\text{g},x} - V_{\text{wind}})\frac{W}{L}}\\
&= H\frac{L}{D} \frac{V_{\text{g},x}}{V_{\text{g},x} - V_{\text{wind}}}\\
&= H\frac{C_L}{C_D} \frac{V_{\text{g},x}}{V_{\text{g},x} - V_{\text{wind}}},
\end{aligned}
$$

which implies a positive V_{wind}, or a tailwind increases the range, if $V_{\text{g},x}$ is a constant.