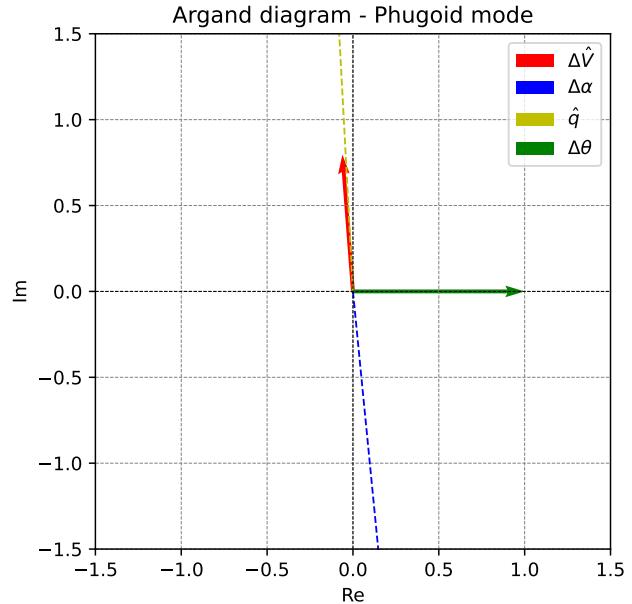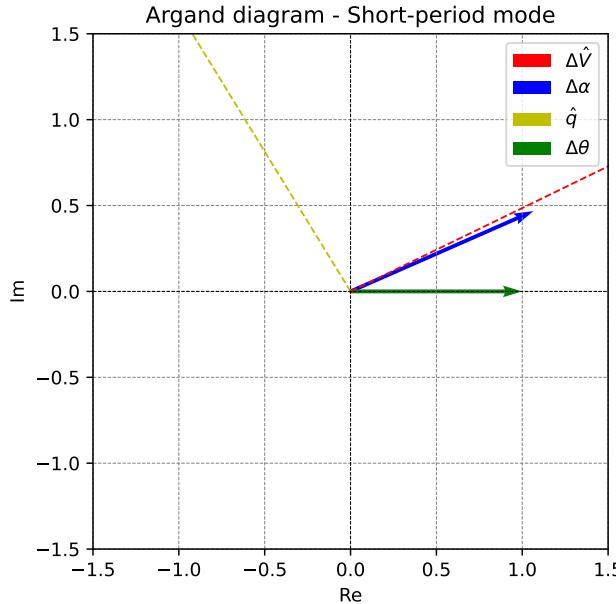# Argand diagrams of aircraft longitudinal modes

Equilibrium conditions: $V_e = 500\,\text{mph}$, $\gamma_e = 0°$, $\rho_e = 0.458\,\text{kg/m}^3$, $SM = 0.15$

In the phugoid mode, the state variables that exhibit the largest variations are the airspeed V and the elevation angle θ, with the former leading the latter by approximately $90°$ in phase. The angle of attack α and the pitch rate q remain practically constant; their minimal variations are barely visible in the diagram and their direction is therefore indicated with dashed lines.

In the short-period mode, the largest changes occur in the incidence α and the elevation angle θ, while the variations in airspeed V and pitch rate q are negligible.