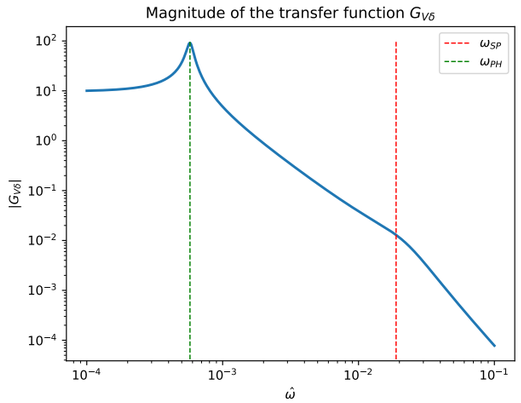
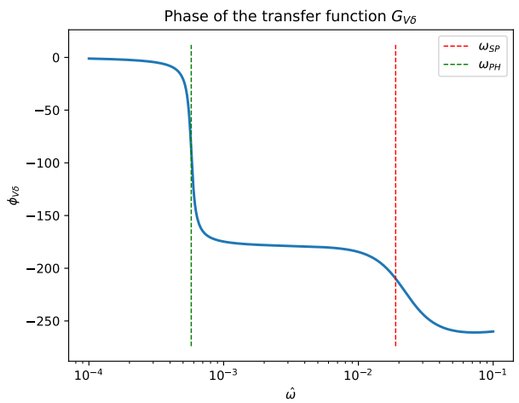
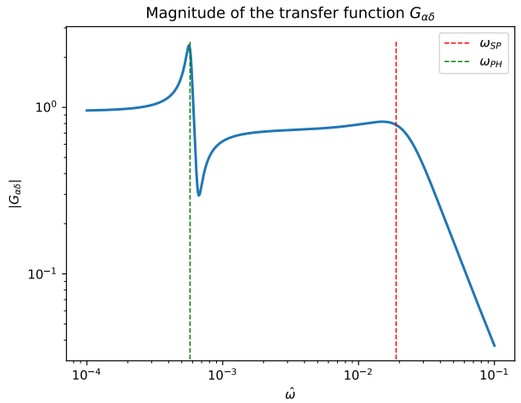
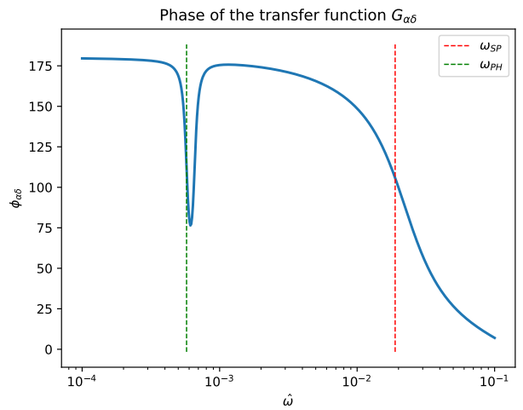
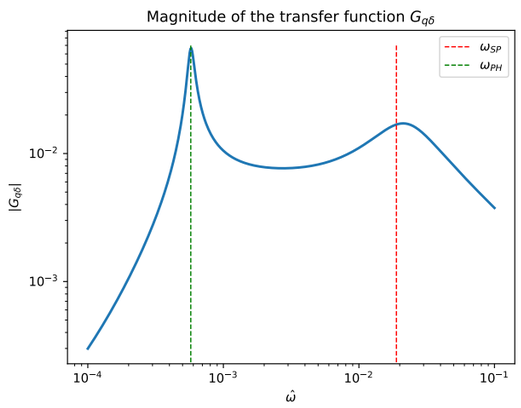
Magnitude and phase of elevator transfer functions

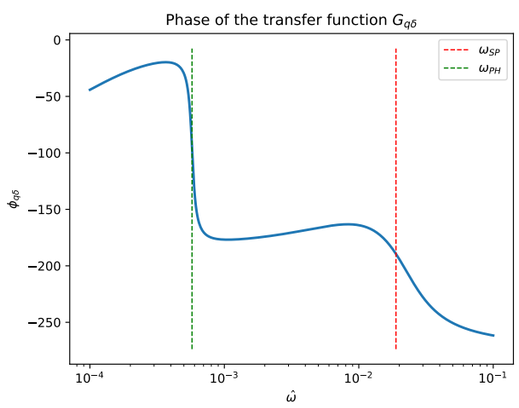


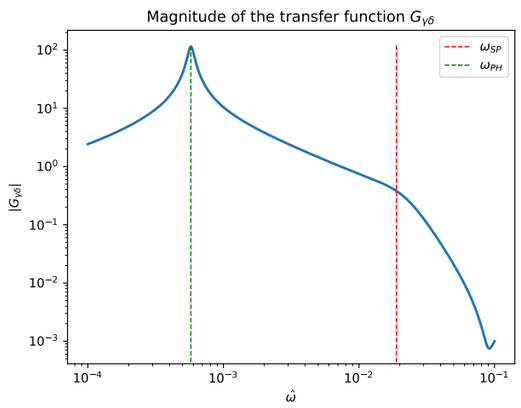


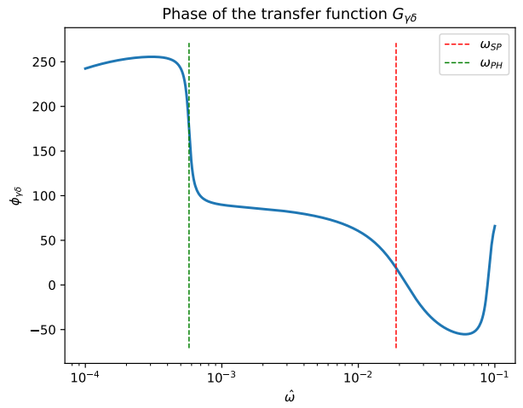


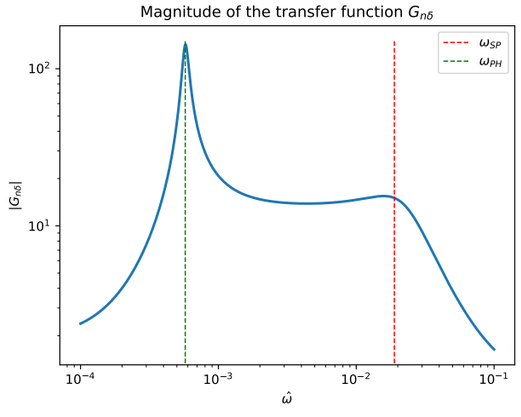


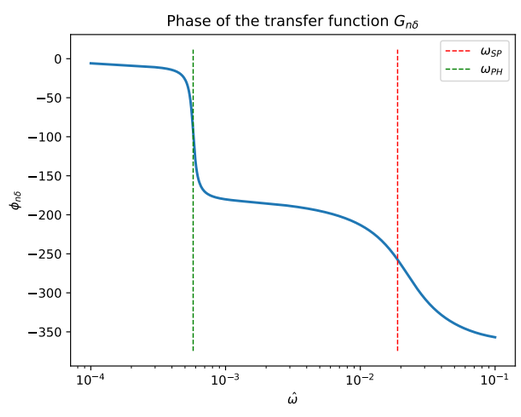












It can be observed that the magnitudes of the transfer functions of the airspeed V, flight-path angle γ, and load factor n exhibit a pronounced peak at the phugoid-mode frequency, indicating a strong amplification of the elevator input. For V and γ, the magnitude rapidly decreases as frequency increases, becoming negligible beyond the short-period mode frequency.
The transfer functions of the angle of attack α and pitch rate q show two distinct peaks associated with the phugoid and short-period modes, although their overall magnitude remains limited, with the exception of the α peak at the phugoid frequency. Above the short-period frequency, the magnitude of both α and q decays rapidly.
The phase behavior reflects the contribution of the two natural modes, with pronounced transitions in the vicinity of their characteristic frequencies. Overall, the load factor n is the variable most strongly amplified by elevator deflection.