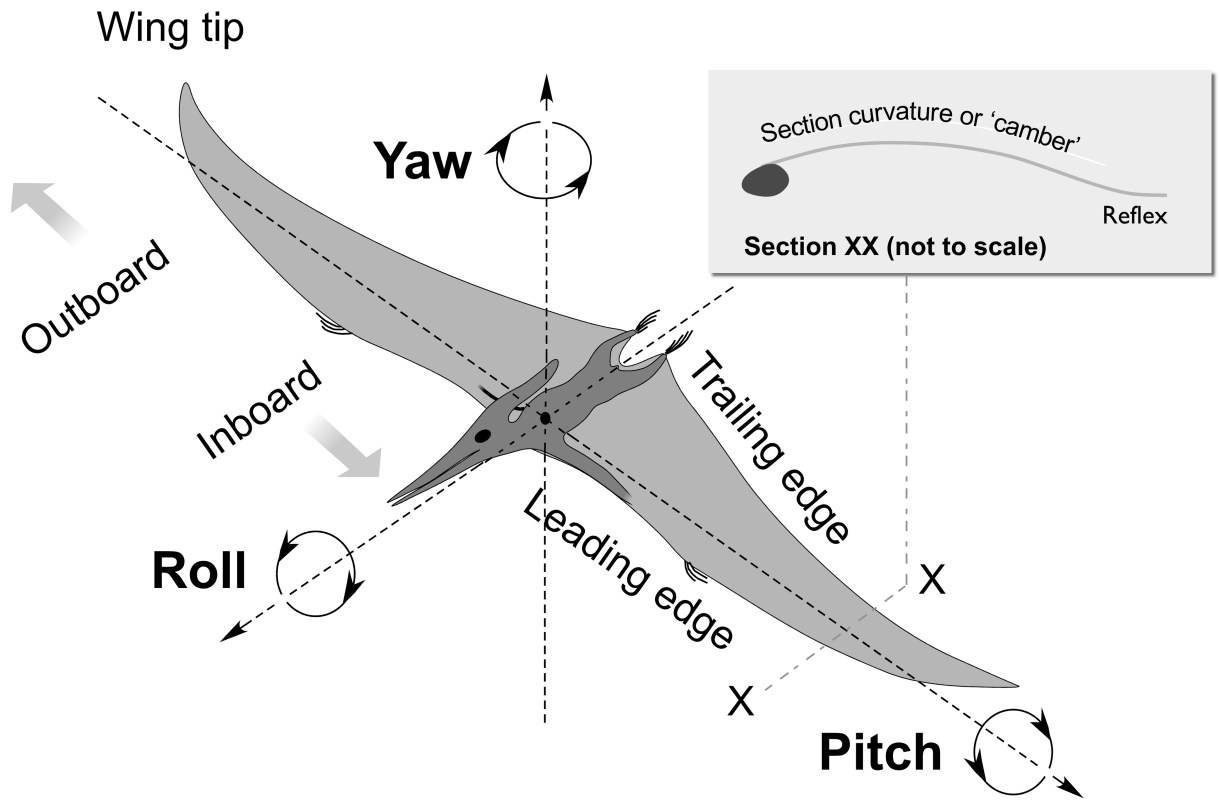
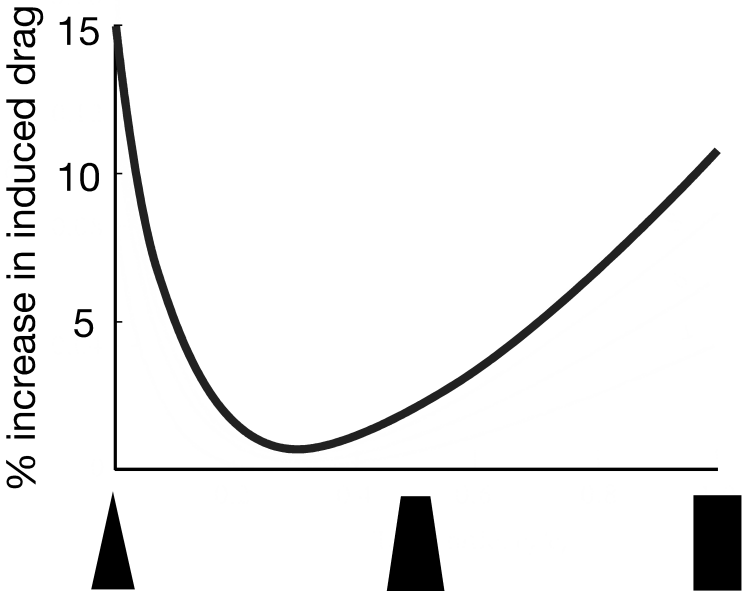
Figure 3.1



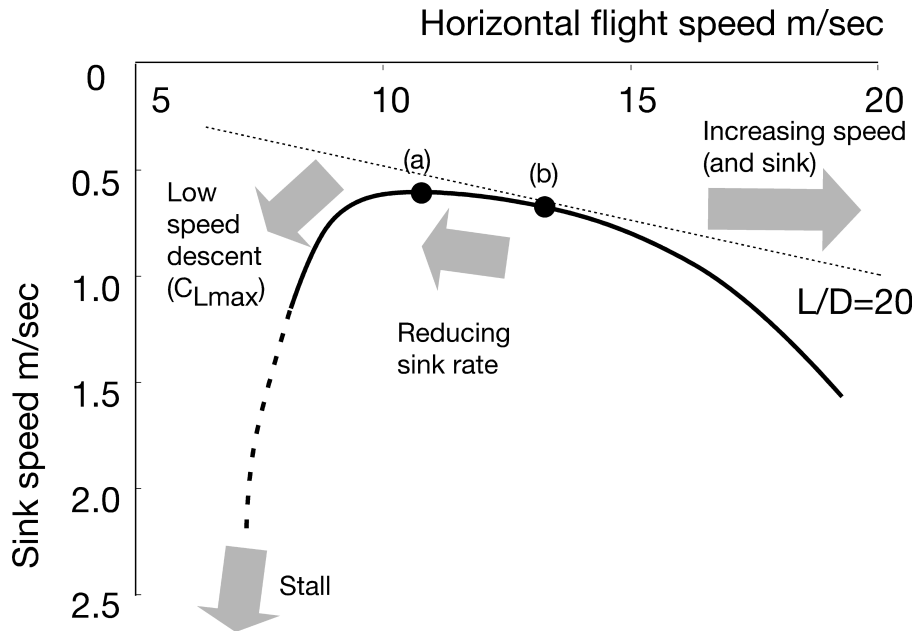
Aerodynamic terminology used in descriptions of flight capabilities and characteristics.

Figure 3.2



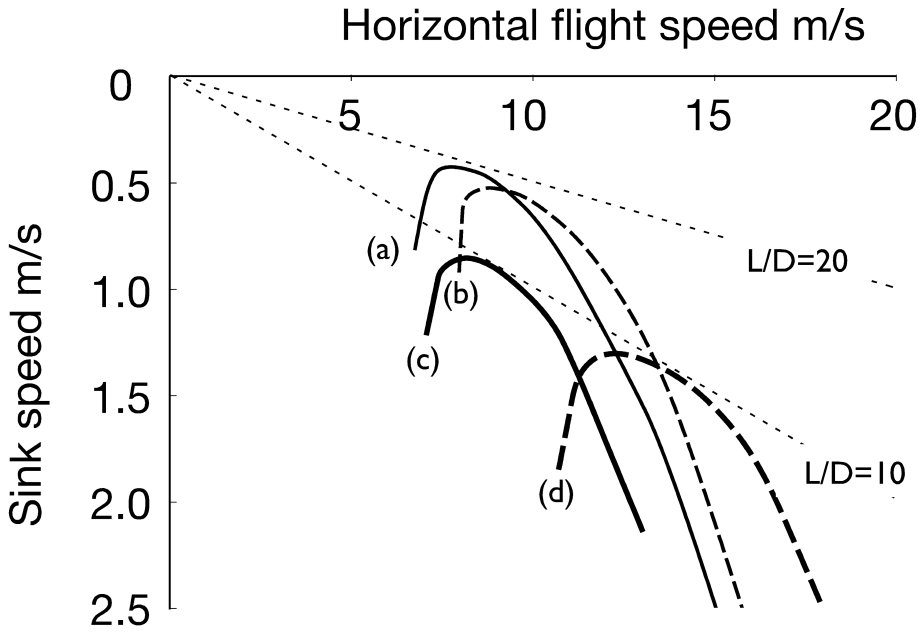
Effect of wing planform shape on induced drag. Moderate taper resulting in the lowest induced drag, while a triangular planform can increase it by as much as 15%.

Figure 3.3



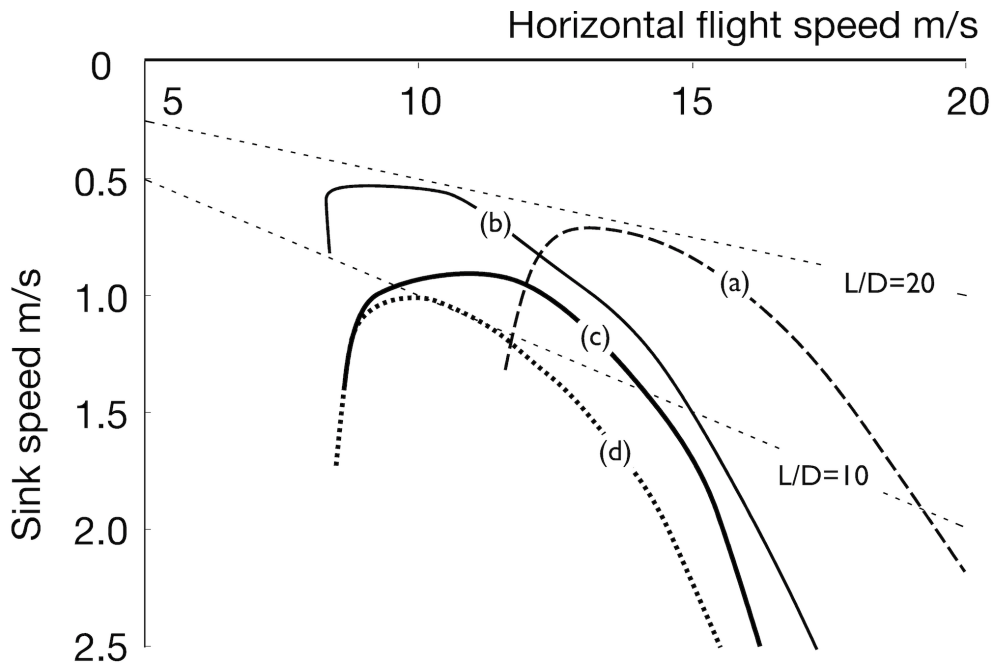
Generic flight polar curve. Broad arrows indicate behaviour in different parts of the envelope. Point (a) is the minimum sink speed and point (b) the maximum range speed (in still air).

Figure 3.4



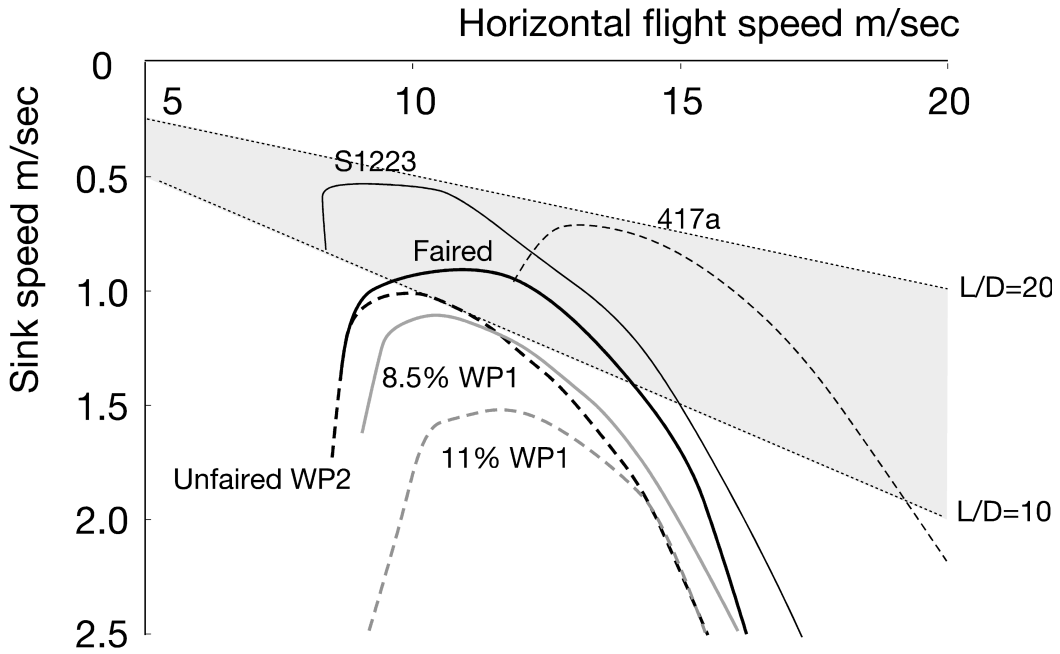
Calculated flight polar curves. (a) Bramwell & Whitfield (1974), (b) Brower (1983), (c) present study, using WP1 wing section results at 13.9kg body mass, and (d) at 32kg. Note the substantial reduction in L/D ratio compared to earlier studies, due mainly to the adverse effects of leading edge wing bones, an effect that could not previously be quantified.

Figure 3.5



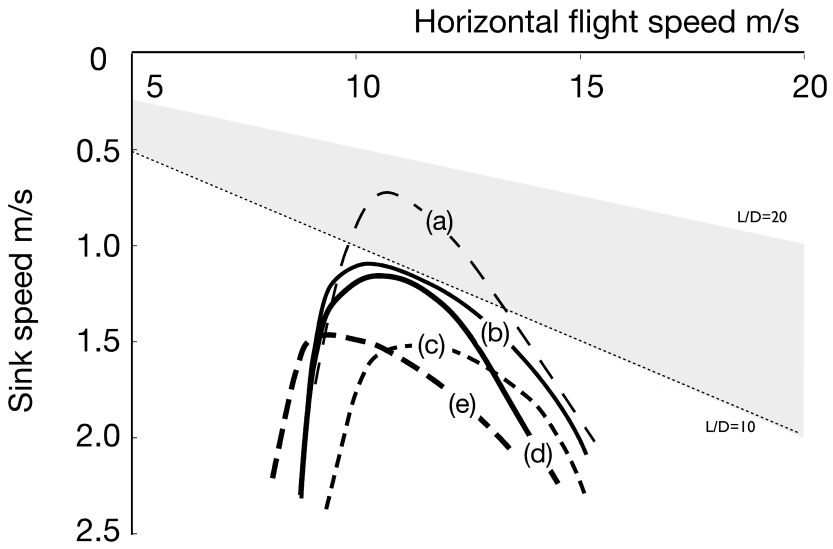
Calculated flight polar curves. (a) G417a airfoil, as used by Bramwell & Whitfield (1974), (b) Selig S1223 high efficiency, low Re airfoil, (c) present study, faired WP2 wing section and (d) unfaired. Here again, the adverse effects of leading edge wing bones are apparent.

Figure 3.6



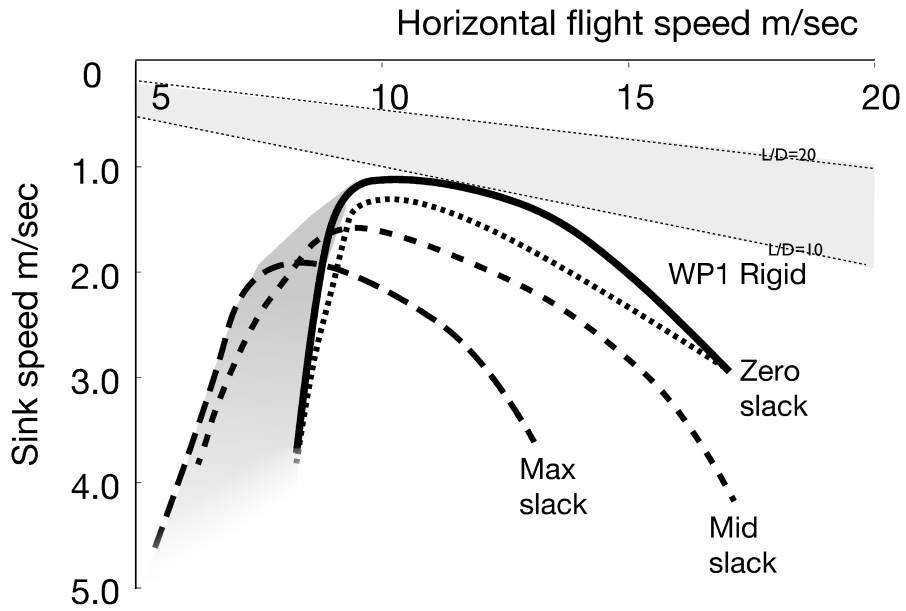
Calculated flight polar curves. G417a and S1223 and faired WP2 section as in Figure 3.5. Additional curves show results for the WP1 section at 8.5% and 11% camber ratio. The increase in camber results in a significant reduction in performance.

Figure 3.7



Calculated flight polar curves. Effect of wing bone thickness. (a) 11.6% camber alone; (b) 11.6% camber with small (7.0% chord) WP1 wing bone; (c) 11.6% camber with large (9.4% chord) WP1 wing bone; (d) 9.7% camber with small WP2 (7.5% chord) wing bone and (e) 9.7% camber with large (10.0% chord) WP2 wing bone. It is apparent that the wing bone diameter is an important effect (compare (b) and (c) for example), with wing bone shape and wing camber being less significant ((b) and (d)).

Figure 3.8



Calculated flight polar curves. Flexible sections. With increasing slack (camber) in the section, the minimum sink rate is increased, but at the same time the flight speed decreases. The darker shaded area is the envelope of the different degrees of membrane slackness.