

The Aerodynamics of Other Stuff

1. It's a drag – well, actually, It's two categories of drag
 - a. What are the two major categories of aerodynamic drag?
 - b. One of those categories is broken down into three subtypes – what are these (and describe in basic terms by what characteristics they are distinguished)?
2. Aircraft have retractable landing gear primarily reduce drag. These aircraft also include at least two additional 'V-speeds': V_{LE} – the maximum indicated airspeed at which the landing gear can be in the fully extended position and V_{LO} – the maximum indicated airspeed the landing gear can be operated (raised from or lowered to the fully extended position. In some cases these speeds differ? Why?
Hint – This question is still talking about drag.
3. Trim tabs –
 - a. What is the purpose of a trim tab?
 - b. Do all control surfaces have them?
 - c. Can you adjust all trim tabs from the cockpit while in flight?
4. In addition to serving as a means of trimming to the desired pitch attitude / angle of attack, what purpose does the anti-servo tab of a stabilator serve?
5. Adverse yaw –
 - a. What causes it?
 - b. How do differential ailerons reduce adverse yaw?
 - c. How do Frise ailerons reduce adverse yaw?
6. Why are V-speeds based on indicated airspeed? (Or maybe they aren't – maybe it's true airspeed – I don't know ... I'm so confused!!!!)
7. Almost every aircraft has some degree of 'wing washout', even your trusty Cessna 172 (and your trusty FA-18, too!). What is wing washout and why do aircraft have it?
8. Aerodynamics of gliding: You are flying a Cessna 172SP – brand new, perfectly tuned – and you are flying in formation with your friend who is also flying a brand new, perfectly tuned Cessna 172SP that was made right alongside yours on the assembly line in Independence, KS. You can't get two planes more perfectly matched than that!! The only difference is that your friend has his family on board and you are 'solo', so about 450 lb. lighter than your friend's aircraft. Suddenly, your perfectly matched aircraft lose their engines at the same time (well, they are 'perfectly matched'). You both head for a local cornfield that has parallel roads perfect for the two of you to make parallel emergency landings.
 - a. Being the lighter aircraft – will you be able to land at a point farther down your road so as to give some margin of safety vs. landing directly alongside your friend? If so, approximately how much farther down the road (how much margin of safety) can you provide?
 - b. Being the lighter aircraft, is the point in 'a', above moot because you will reach your landing spot first and will have plenty of time to roll out and be well away from your friend's touchdown point?
 - c. Where is the best glide speed found on the total drag curve and under what weight condition(s) is it determined?
9. What is 'decalage' when used with respect to airfoils?