	<i>Antelope Valley Tailwinds Technical Info</i>		
	Subject	Adverse Yaw	
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Adverse Yaw is an undesirable condition where the aircraft yaws in the opposite direction to a banking turn using the ailerons.

Lift and drag are like the old song “horse and carriage” you can’t have one without the other. Mother Nature says “When you produce more lift, you produce more drag” For example, thick airfoils produce more lift but also produce more drag. Thin airfoils produce less drag but also produce less lift. Also for a given airfoil, flying at higher angles of attack produce more lift but considerable more drag than flying at a zero angle of attack.

When executing an aileron turn, the down aileron increases the lift on the wing just like a flap produces more lift. While producing more lift it also produces more drag. Unlike flaps only one wing has a downward surface causing an imbalance. The wing with the downward aileron produces more lift but also more drag than the other wing. This slows the wing and causes the plane to yaw in the opposite direction to the aileron input. The opposite upward aileron reduces lift and therefore lowering that wing.

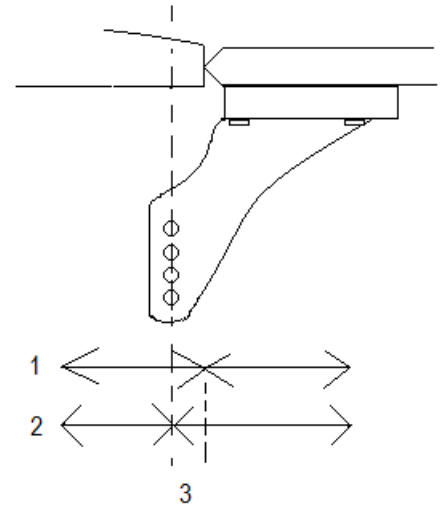
With all the new programmable radios this is an easy fix by programming aileron differential. Oh no not another technical term ugh. Differential basically means “a difference between two equal things”. For example if you compare two exactly equal things there is no differential or difference between them. If one however moves two degrees more than the other, the two degrees is the differential or difference between them. Programming your radio for aileron differential is discussed in a separate Tech Info Sheet.

Wing design minimizes adverse yaw. Strip ailerons produce less adverse yaw than outboard ailerons because their center of area is closer to the CG. If your plane exhibits adverse yaw there is a mechanical fix you can implement.

The illustration below shows how to obtain aileron differential by moving the aileron control horn.

**1** illustrates that by mounting the control horn at the hinge line results in equal throws or deflection of the aileron, up and down. (No differential)

**2** illustrates that by moving the control horn towards the LE results in an unequal throw or deflection of the aileron. In this case the result is less down and more up for a given servo movement. This is the desired result to minimize adverse yaw. The reverse is true if the control horn is mounted on top of the aileron.



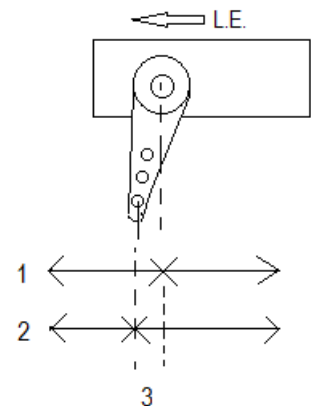
**3** illustrates the resulting difference in the aileron throw or deflection from a normal control horn set-up. (Differential)

The illustration below shows how to obtain aileron differential by moving the servo arm or servo control horn towards the leading edge.

**1** illustrates that mounting the servo arm or control horn at the servo zero point results in equal throws or deflection of the aileron, up and down. (No differential)

**2** illustrates that by moving the servo arm or servo control horn towards the LE results in an unequal throw or deflection of the aileron. (See the instructions supplied with the servo) In this case the result is less down and more up for a given servo movement. This is the desired result to minimize adverse yaw. The reverse is true if the aileron control horn is mounted on the top of the aileron.

**3** illustrates the resulting difference in the aileron throw or deflection by moving the servo arm or servo control horn. (Differential)



The question is how much differential you use. Always work within the plane manufacturer's recommended settings. The rule of thumb is a maximum ratio of 2.5 to 1, up verses down. For example if the manufacture recommends 250 up and 250 down change down to 100 then up would be 250. In some case a 50 differential is a good place to start, for example 250 up and 200 down. There is some trial and error required in either method you use.

If set-up does not work completely, then using the rudder to cancel the remaining adverse yaw will work. Input a little rudder in the direction of the turn. The rudder causes the nose to yaw in the direction of the turn and speeds up the wing with the down aileron eliminating the drag effect.