



## *Antelope Valley Tailwinds Technical Info*

Subject	PID Loops CGY-750 and HH gyros		
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PID loops are common to many control systems. PIDs are simple in basic function but complex in execution.

**P Gain** or "gyro gain" is the multiplier. It is similar to what we are all used to dealing with Gyro Gain. This gain affects all parameters of the PID loop. Set too high; we notice the "constant" correction like the tail wag.

**I Gain** is the integrator portion. It is a continuous function where a certain "position" is held. Constant corrections here although minute will give the helicopter a locked in feel. If this is too high, the control system will fight any control inputs the pilot introduces. This would feel like the heli is slightly delayed or has a whole lot of expo. If this is too low, we will get a "floaty" or "dynamic" feel. This portion of the control system is a large part of the "Heading Hold, AVCS" feature.

**D Gain** is the Differentiator portion of the control system. This section handles the amount of correction needed in respect to amount and time. The older rate gyros were PD control systems. If there was a high rate of change, the Differentiator would correct with a "dampened" response. The dampened response would be quick overcorrection then a subsequent correction of the correction. What we see is the tail has moved from its original position, or drift from the original position. If this number is too high, we will notice the quick intermittent wobble. This wobble is because the control system is hunting for an equilibrium point; this is also an over damped response. The loop will be overcorrecting the correction. If this was too low, one will notice after a quick roll or flip, the heli will continue through the roll or flip a few degrees versus just stopping after the control input is removed.

Ok what does this all mean?

P gain or the "main" gain affects all aspects of the control system

I gain affects the overall feel of stability or Heading Hold

D gain affects the correction response, and how fast the correction occurs

Vibrations are very problematic particularly the high frequency variety. This is where the beastx seems to do a little better due to its physical size.

Vibes are noticed on the I gain side of the loop as a drift while on the D gain side could appear to be a sudden control input in X or Y direction.