

19.1 Advanced Tuning Options

The helicopter can be tuned in a more detailed way using the advanced user settings of the SK720 setup software. To enable the advanced settings, select the *Advanced* interface from the *Preferences* menu.

Cyclic Tuning Tabs

The two *Cyclic* tabs are found in the *Offline Setup Values* region of the main SK720 setup software window as shown in Figure 19.9 below. The tab that is currently active is denoted by the blue bar. Switch the active tab using your transmitter's gain/bank channel.

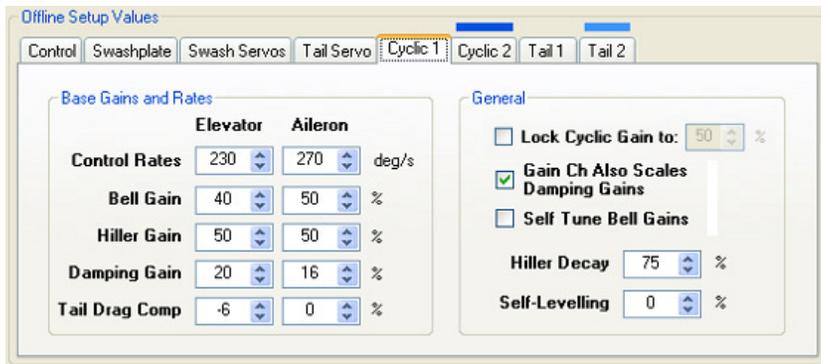


Figure 19.9 – SK720 Setup Software *Cyclic* Tabs

Control Rates: The roll or pitch rate of the helicopter at maximum cyclic stick deflection. This setting has a similar effect to changing the area of a flybar's paddles.

Bell Gain: Amount of motion of the swashplate in response to cyclic stick deflection, normally auto-tuned by the SK720.

To manually adjust the Bell gains: While in a hover, pitch the helicopter sharply nose down, centre the cyclic stick and then do the same nose-up. If the helicopter is slow to respond, turn the Bell gain up a small amount. If the helicopter snaps back a bit and oscillates after it stops, turn the Bell gain down a small amount. Repeat until you get the best balance. For sport flyers, the Bell gain needs to be only roughly correct.

Hiller Gains: This gain's effect is similar to "heading hold" on a yaw gyro. Higher Hiller Gain is equivalent to increasing the weight of a flybar's paddles and adds stability and resistance to wind gusts. This feature gives the heli a "locked-in" feel. Slop-free linkages, rigid rotor head mechanics, stronger servos and stiff blades allow higher gains here. When hiller gain is too high, the heli will oscillate at 1-2 cycles per second.

Damping Gains: Roll and pitch rate motion damping. Higher gain helps with stability and is equivalent to having heavier rotor blades or a higher head speed. Fast digital servos allow higher gains here. The default gains are best for analog servos but can be set to 20/16 for digital servos. When damping gain is too high, the heli will oscillate quickly.

Tail Drag Compensation: All helicopters have uneven drag on their airframes, especially the tail., use this setting to trim out the effect of tail boom drag for better pirots and tick-tocks.

Lock Cyclic Gain: This allows you to lock in the value for overall cyclic gain, which the gyro uses to scale the Hiller and Damping gains. The gyro will then only pay attention to the gain channel for selecting this bank, but it will ignore the % value the channel has.

Cyclic Gain Channel Also Scales Damping Gain: If enabled, then the Cyclic gain channel will also adjust the damping gains by the ratio of the Cyclic Gain input vs. the elevator Hiller gain in the setup.

For example, if Elevator Hiller gain is 50% on a Cyclic gains tab, the Cyclic Gain channel is set to 100% and Damping is set to 20% for elevator on the Cyclic gains tab, then the resulting damping gain would be $100/50*20 = 40\%$.

This option can make it easier to re-tune the gyro when mechanical changes are made that will affect the gains, such as to cyclic pitch or head speed.

Self Tune Bell Gains: If enabled, the SK720 will auto-tune the Bell Gains in flight and save the new values in the setup a few seconds after it lands. To lock in the values once auto tuning is complete, disable this checkbox.

Note: If you have auto-bell tuning on and it sets the bell gain above 85%, then the control rates are higher than your helicopter is capable of.

Hiller Decay: Causes accumulated Hiller response to decay back to neutral, to make the gyro more forgiving of perturbations. If you watch a helicopter with a flybar in hover, you'll see the flybar's disk offset for a moment then drift back to level after a sharp control input. This option provides the same effect digitally.

A value of 100% here can help smooth out rapid tic-tocks, pirots or other 3D maneuvers, especially repeated ones. However, high values for Hiller Decay will also limit the gyro's ability to hold steady in gusty wind or trim the helicopter precisely in hover.

Self-Leveling: Sets how strongly the helicopter tends to pull itself towards level in elevator and aileron. Set the Self-Leveling value to a higher value (i.e. 75%) in one of the two Cyclic tabs to enable a "bail-out" switch. Activate the bailout mode by switching to that bank.

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Tail Tuning Tabs

The two *Tail* tabs are found in the *Offline Setup Values* region of the main SK720 setup software window as shown in Figure 19.10 below. The blue bar marks the tab that is currently active. Switch the active tab using your transmitter.

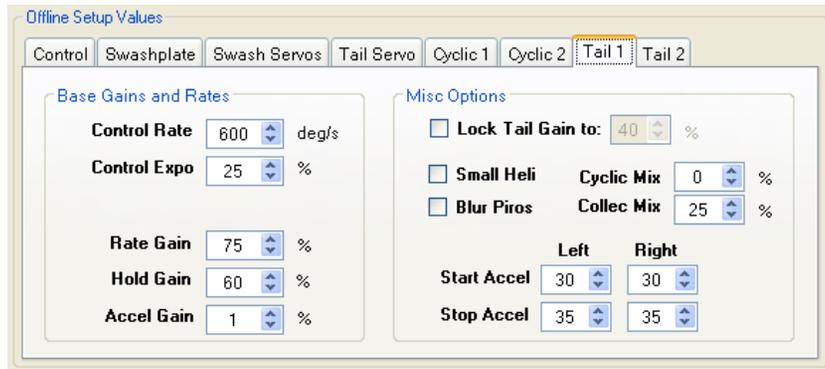


Figure 19.10 – SK720 Setup Software *Tail* Tabs

Control Rate: Sets the maximum allowable yaw rate of the helicopter at maximum rudder stick deflection.

Expo: Positive values make the rudder stick less sensitive near center-stick, negative values make it more sensitive near center.

Rate Gain: The response of the tail blades to the error in rate of motion. This is the tail's primary gain.

Hold Gain: The response of the tail blades to accumulated tail position error. This allows the gyro to trim the tail and compensate for wind. Set this value to 0% for rate mode. Set this value to about 60% for heading hold.

Accel Gain: Response to acceleration error of the tail. Gives a sharper response but is normally set low or to zero. Sometimes helpful on smaller helis that feel “loose” near center. This gain can be hard on the tail servo, especially if there is a lot of vibration.

Small Heli: This option increases the response delay that the system expects the tail servo to have. It is useful for helicopters 450 size and smaller.

Blur Piros: This option makes it so a 100% input on the rudder stick will make the heli jump to a piro rate of 900 degrees per second (very fast).

Start Accel: The maximum rate of starting acceleration of the tail, left or right. If the value is too low, the helicopter will seem sluggish in yaw. If it's too high, it will tend to bounce even at low gains.

Stop Accel: The maximum rate of stopping acceleration of the tail. Normally a little bit higher than the start acceleration.

Cyclic to Tail: Feeds in tail pitch to directly compensate for torque changes due to changes in blade pitch due to cyclic (aileron and elevator). Normally 0% to 15%. Increase this value if the helicopter's tail twitches to the right during flips.

Collec to Tail: Feeds in tail pitch to directly compensate for torque changes due to changes in collective pitch. Normally 15% to 30%. Increase this value if the helicopter's tail twitches to the right during climb outs.

Tail “Rate Mode” and “Heading Hold”: Set the hold gain to 0% for rate mode. Set the hold gain to about 60% for heading hold mode.