Flight Notes By Flightengr

Blade 350 QX Series Flight Modes

This issue of Flight Notes will provide a description of the various flight modes on the Blade 350 QX series.

How the Flight Modes Behave

Smart Mode (Green LED) [Available in All Firmware Versions]
Smart Mode has the most computerized assistance of all of the modes, so of course that makes it very easy to fly. But what's a bit odd about Smart Mode is that it uses a concept called "Stick Relativity" for steering control instead of the orientation of the aircraft. Normally when you fly an RC aircraft, the way the aircraft is facing (its orientation) defines "forward", "left", and "right" - it's all based on the aircraft's point-of-view. In contrast, Stick Relativity is always based on the pilot's point of view on the ground. The benefit of Stick Relativity is that you don't need to worry about which way the aircraft is truly facing in order to steer it, but that's also a big drawback because you can't learn and practice the appropriate steering controls for any of the other 350 QX's flight modes or for other RC aircraft. So in a sense you're learning bad habits by flying around using Stick Relativity. It's nice for an emergency where the quad gets away from you and you can't see the it well enough to know which way it's facing, but that's really about the only time most experienced RC pilots would tell you to use it.

With Stick Relativity, your aileron and elevator stick commands for forward, back, left, and right are interpreted as "away from me", "toward me", "to my left", and "to my right" from your point of view on the ground.

The key assumption for Stick Relativity is that you as the pilot stand in a preset spot and don't move from that spot. That spot is about 15 feet behind where you set the quad down, turn it on, and let it initialize. You must set the quad down so that the front of the quad is facing away from you, and then you would simply take 5 or 6 steps back from it. Again, then you can't move! The electronics are not sophisticated enough to know where your transmitter really is. Instead, it merely assumes you are standing 15 feet behind the spot where it started from.

Along with the Stick Relativity and this stay-in-one-spot idea comes the SAFE Circle. The SAFE Circle is an imaginary circle with a 15-foot radius/30-foot diameter. When in Smart Mode, the quad will not enter the SAFE Circle area as a safety feature to keep the quad away from the pilot. That makes for a neat trick - you can pull back on the elevator ("toward me" input) and at the same time give it either left or right aileron. That will make the quad move around you in a circle, around the perimeter of the SAFE Circle. There is an exception to the rule - if you activate the Return to Home (RTH) feature, it will go directly to the home/starting point, even if that means going through the SAFE Circle to get there. Also, strange things can happen if you switch flight modes in mid-air and go into Smart Mode while the quad would be inside the SAFE Circle.

A nice feature of Smart Mode is a very strong and very fast position hold feature. If you let go of the aileron/elevator stick and let it self-center, the quad will level itself, stop and hover in one place.

There is quite a bit of altitude assistance with Smart Mode. How that works depends on your version of firmware.
Firmware Versions 1 and 2: In Smart Mode, your throttle input is considered to be a request for a certain altitude. The bottom of the throttle stick is the ground, and full throttle is about 150 feet. Moving the throttle up or down will change the altitude of the quad relative to that scale. For example, half throttle is 75 feet up. There is no correlation between motor RPM and your throttle input - the computer handles that and ensures that the quad maintains the requested altitude.
Firmware Version 3: The center of the throttle stick means "hover" or maintain current altitude. Moving the throttle stick above center means "go up" or increase altitude. Similarly, moving the throttle stick below center means "go down" or decrease altitude. This can be a bit awkward for taking off from the ground, as you need to move the throttle stick up to the halfway point before anything happens, and that's a little unexpected for anyone with experience with RC helicopters.

Smart Mode also limits the bank angle of the aircraft. It will not bank/tilt very far, so its speed is somewhat limited but it also can't tip over and cause an unexpected crash.

Firmware version 3 added a "geofence" feature. Using the PC interface (also new with firmware version 3) and a USB programming cable (Blade part number BLH7840), you can configure limits for both altitude and distance from the home point (takeoff location). Those limits apply to Smart Mode and AP Mode.

AP Mode (Purple LED) [Firmware Versions 2 and 3 Only]
Aerial Photography Mode (AP Mode) takes away many of those features of Smart Mode, giving you a fairly docile version of the 350 QX with standard steering controls. AP Mode was introduced in firmware version 2.

Like Smart Mode, AP mode also provides altitude control. In AP Mode, the center of the throttle stick means "hover" or maintain current altitude. Moving the throttle stick above center means "go up" or increase altitude. Similarly, moving the throttle stick below center means "go down" or decrease altitude. This can be a bit awkward for taking off from the ground, as you need to move the throttle stick up to the halfway point before anything happens, and that's a little unexpected for anyone with experience with RC helicopters. Unlike Smart Mode, there is no programmed upper limit for the altitude. (The ICAO and the U.S. FAA would like you to stay under 400 feet / 125 meters.)

AP Mode offers a GPS column lock feature, meaning that if you let off the aileron/elevator stick and let it self-center, the quad will settle into a hover in one vertical column using GPS to keep it there. However, it's worth noting that this lock effect has a delay of a couple of seconds. That's intentional so that the quad doesn't come to a sudden stop, but instead it gently coasts into a column lock. It's different than Smart Mode which stops and locks almost instantly after you let off the stick. If you're used to Smart Mode, then there's a couple of seconds there where you wonder if the quad is really going to stop and lock or if it will keep drifting!

AP Mode has a self-leveling feature, so letting off the aileron/elevator stick will also make the aircraft level itself out. This is in contrast to a conventional RC helicopter that does not self-level and instead maintains the last tilt direction command you gave it until you give it an opposite command to force it to become level.

Like Smart Mode, the bank angle is limited in order to prevent accidents and control the lateral speed of the quad. In order to make smooth videos, the bank angle is quite limited in AP Mode, and there have been some reports here about having difficulty steering the quad in AP Mode against the wind because of this limit.

Firmware version 3 added a "geofence" feature. Using the PC interface (also new with firmware version 3) and a USB programming cable (Blade part number BLH7840), you can configure limits for both altitude and distance from the home point (takeoff location). Those limits apply to Smart Mode and AP Mode.

Stability Mode (Blue LED) [Available in All Firmware Versions]
Stability Mode and AP Mode are very similar, but Stability Mode is for slightly more advanced flying instead of smooth videos.

Stability Mode does not help you with altitude. In Stability Mode, the throttle controls the motor RPM like it would in a conventional heli. So now it's up to you to control the throttle such that the quad will hover in place.

Stability Mode does have the same GPS column lock feature as AP Mode as well as the self-leveling. Let off the aileron/elevator stick, and the quad will coast into a lock in a vertical column.

Bank angle is a little less limited in Stability Mode than it is in the previous modes. It still won't let you roll the quad over, but it will give you a little more tilt for more speed.

Agility Mode (Red LED) [Available in All Firmware Versions]
In Agility Mode, all of the computer assistance is off and you're in total control! Of course, that's ideal for acrobatic flight and for getting the most fun out of this sport-flying machine.

Agility Mode treats the throttle like motor RPM, just like Stability Mode. There is no column lock or self-leveling, so it will act a lot more like a traditional heli. And finally, there is no limit on bank angle, so you can fly fast and also flip it upside down.

Agility Mode is definitely for experienced pilots only, so don't try Agility Mode until you're very comfortable and confident with your piloting skills in Stability Mode.

What is "Stagility" Mode?

"Stagility" is a term that was coined on the Internet by user Indoorheli. It's not a true flight mode on the 350 QX. Instead, it's a mixing trick on the transmitter that will automatically put the 350 QX into Agility Mode if you're in Stability Mode and you move the aileron/elevator stick all the way to one side. That will allow you to flip the quad over (something you can only do in Agility Mode), but then it returns to Stability Mode as soon as you release the stick.

You must have a programmable transmitter in order to create Stagility Mode. Doing so usually requires two or three mixes on your transmitter, depending on the firmware version on your 350 QX.

Changing Modes in Mid-Air

The 350 QX will allow you to change flight modes in mid-air. However, that's not always a good idea! The biggest thing to consider is how the throttle stick works in the mode you're currently in, and how the throttle stick will behave in the mode you're changing to. Smart and AP Modes both have automatic throttle and altitude control based on the position of the throttle stick, but Stability and Agility Modes give you direct control over the motor speed using the throttle stick. Changing from AP Mode to Stability Mode, for example, could result in a sudden change in altitude. Also, remember that Smart Mode is the only mode that uses Stick Relativity for directional control; all other modes are based on the true orientation of the aircraft.

You can safely turn on the Stagility Mode mix while in mid-air in Stability Mode.

And of course, you can activate Return to Home at any time.

Transmitter Setup for Flight Modes

For all firmware versions, the value of the Gear channel on the transmitter determines which flight mode is active.

With firmware versions 1 and 2, the Return to Home feature had a dedicated channel (Aux1). In firmware version 3, Blade found another use for Aux1, so the Return to Home feature was added to the flight modes on the Gear channel.

It's worth noting that the 350QX accepts a range of values for each flight mode. The specific values below are common reference points (mostly from Blade's documentation) used for setup on the transmitter switch.

Firmware Version 1

In the original version of the 350QX, there were three flight modes that correspond to the default settings of a three-position switch on a transmitter (+100%, 0%, and -100%).

Smart Mode	+100%
Stability Mode	0%
Agility Mode	-100%

Firmware Version 2

Firmware version 2 added AP mode, which Blade wanted between Smart Mode and Stability Mode on the default switch setup for the RTF transmitter. To access Agility Mode, you must have a programmable transmitter that allows you to modify the travel on the Gear channel or otherwise create a custom switch setup. Note that Agility Mode is available at either the high end of the value range or the low end. That gives you the option to replace either Smart Mode or Stability Mode with Agility Mode through a simple transmitter adjustment to travel.

Smart Mode	+100%
AP Mode	0%
Stability Mode	-100%
Agility Mode	-125% or +125%

<u>Firmware Version 3</u>

In firmware version 3, Blade moved the Return to Home control into the flight mode switch. They did that so they could add some gimbal control to a 6-channel transmitter (such as the one included in the RTF package.) Since version 3 is targeted at AP applications, Blade made the three default modes Smart, AP, and then Return to Home. There is a way to access Stability and Agility on the RTF transmitter through a sequence of switch-flipping.

Smart Mode	+100%
AP Mode	0%
Return to Home	-100%
Stability Mode	+110%
Agility Mode	+140%