

## WHAT TO DO WHEN YOUR UAV GOES BVLOS ?

By Tom Inderkum

We have all been there. Your flying your plane or quad-copter when all of a sudden you realize that you have either become disoriented or you have taken your eyes off the model momentarily and have lost sight of it when you look back to find it. Panic sets in as you realize that your UAV (unmanned aerial vehicle) is about to go BVLOS (beyond visual line of sight). What you do in the next few seconds will determine if you ever see your model again. First and foremost, announce in a loud voice that you need help! The more eyes scanning the horizon the better. If you are flying a plane and can see your model but are unsure of it's orientation give it a little throttle and pull up elevator at the same time. This does three things. First, it changes the profile of the plane abruptly and helps you to determine its correct orientation (attitude).

Secondly, it slows the continued forward motion so that your model doesn't keep getting further and further away. And third, it gains a little altitude. The old saying that you want to be "three mistakes high" is never more true than at this moment. If you still can't see your model but someone else can then consider handing the transmitter to them (assuming they are a willing and trusted pilot) and let them navigate the model back until you can see it again.

If you are flying a quad-copter you have a few more options to consider. For the sake of the following discussion I'm going to assume that you are flying "line of sight" rather than "under the hood" (FPV), and that your quad-copter does not have a return to home feature (more on this later...). If your flying line of sight and have gotten a little too far out and can no longer determine which way the craft is pointing, you can take advantage of the fact that copters can hover in place. This will stop the vehicle from getting farther away, though momentum may still carry it a little further in what ever direction it was last heading, which, by the way, may not necessarily be the same direction as it was pointing. Quads are very good at flying backwards or sideways which is why they are so darned easy to get disoriented on in the first place. Once you have it stabilized in a hover you can relax and consider your options. If you have a "Headless Mode" now would be the time to initiate it. This allows you to employ the magnetometer (compass) in the crafts flight controller and allows you to bring the copter back to you by pulling back on the right control stick. In this mode the vehicle does not care which way it is facing, it will simply follow the direction of the stick input regardless of the direction the craft is pointed. A very useful feature indeed! If you do not have a Headless Mode, or have forgotten which switch on your transmitter activates it, all is not yet lost. From a stable hover give the craft some right roll input from the right stick. If the quad copter moves to the right then you know that it is facing away from you. If right roll input causes the quad to move to the left than you know it is facing towards you. Make these inputs brief but fairly strong. You want to create a noticeable movement but do not want to send the quad flying off in a potentially worse direction. With any new quad it's a good idea to practice these stick movements while hovering in close so you no how the craft will react. You don't want to be doing flips when you are a thousand yards out and trying to determine how to fly your copter back home!

If right or left stick inputs from the right transmitter stick don't induce any noticeable movement than it stands to reason that the vehicle must be pointing sideways to your position. And your stick inputs are making it either fly further away or toward you. Unfortunately, from this distance you will not be able to tell which it is from the brief duration of the stick inputs. In this case it becomes a matter of doing the same test again but rather than moving the right stick to the left or right to induce roll, you want to

move the right stick up to cause the quad-copter to travel forward. It will then become visually apparent which way it is facing.

Once you have determined which way your vehicle is facing it really does not matter how you fly it back. You do not have to get it pointed home as you would with a plane. You can simply fly forwards, backwards or sideways as the situation demands. The only thing that is important at this point is that you maintain altitude and close the distance between you and the quad-copter to a point that you are comfortable with.

And finally, a few tips that I found helpful:

- 1) Don't make the rookie mistake of the same color props on all four motors of your quad-copter. You want a good color contrast from front to back to help with orientation when flying out a ways.
- 2) If you have a "return to home" feature use it! Most of these work pretty well most of the time. If yours is based on a GPS system it will likely work flawlessly and the quad will return and land itself within in a few feet of where it took off. Most of the toy and hobby grade quads that claim to have a return to home feature will not be using a GPS system, but rather a magnetometer based system and these are not as accurate as GPS but can still be very useful in a "beyond visual line of sight" situation. Just be sure you take the time to calibrate the magnetometer when you set up the quadcopter for the first time.
- 3) Know where your switch's are without having to look down at your transmitter. The last thing you want to do if your quad is out so far that you can barely see it is to take your eyes off of it to find a switch to activate headless mode or return to home. If you fly more than one quad then by all means set your transmitter up the same for all of them and memorize which switch's control each function.
- 4) Have your name, address, phone # and AMA# on your model. It's your best, and really only chance of getting your model back if it is lost.
- 5) Have a beeper on your model. They cost less than 2 bucks, delivered, from BangGood.com at <https://www.banggood.com/search/beeper.htm>

They can be soldered in place for a quad-copter or plugged into an un-used Gear or AUX channel of a receiver on a plane. I know some of the quad racer pilots will say they don't want to add any unnecessary weight to their quad and I get that, but seriously, the most basic of these beepers only weigh 0.65 gram and that same racer pilot that tells you that this is too much extra weight will do so while he straps on a battery pack that weighs seven grams more than another brand of battery of the same rating. You can always take that beeper back off the model when your racing skills get to the level of big prize money competition!

And finally, whether flying a plane or copter, if you just can't get your orientation back don't make matters worse by letting it fly away. Yell loud for help and as soon as someone has a visual on your model set it down. Have the person who last saw your model remain in place, keeping their eye on the spot it went down on and they can guide you to keep you on track to finding your downed plane or copter. They will be far more useful in keeping you on a straight trajectory than they would be as an extra set of eyes wandering around a thousand yards out in the brush. And once again, and I can't say

this too much, do not let your model continue to fly away. It's better to intentionally down it than to risk having it come down on private property, a power station, highway etc. where it could give our hobby more bad publicity.