II. ArduPilot Mega 2 Quadcopter Alt Hold, Loiter & Position Modes

A. Altitude Hold Mode: (Automatically holds but manually adjustable altitude)

1. Altitude Hold mode behaves like Stabilize mode except that the APM2 will try to maintain the altitude that the Quad was at when you switched to altitude hold mode.
2. In the Mission Planner install “Alt Hold” flight mode only on the center position of your channel 5 3 way switch so you can easily switch back to “Stabilize” if needed.
3. After you achieve a stable hover in Stabilize mode, flip your mode switch to the center to initiate Alt Hold mode. Your Quad will hold that altitude as you fly. Do not move the throttle.
4. When you are done flying in Altitude Hold mode switch back to Stabilize Mode.
5. When resuming “Stabilize Mode” control from an automatic mode your Quad will move in the direction of any throttle movement. You need to be ready to quickly compensate with the throttle.

B. Adjusting PIDs for Alt Hold Mode: Stabilize mode roll pitch and yaw PIDs must already be set.

1. Altitude hold is used by several functions to maintain either a current altitude or altitudes preset in an automatic flight plan. Altitude hold is the most basic automatic function.
2. The “Altitude Error PID” uses altitude error to decide how fast to go to reach the desired altitude.
    a. If your Quad changes altitude more than a meter or so in Alt Hold mode increase the “Altitude Error P” setting above the default “0.50” (Try “0.55”). (KK X525 = 0.50)
    b. If your Quad rapidly bobs up and down in altitude in Alt Hold mode decrease the “Altitude Error P” setting below the default “0.50” (Try “0.45”).
3. The “Thrust Rate PID” P value determines how much thrust to apply to climb or descend.
    a. If your Quad oscillates up and down in Alt Hold mode decrease the “Thrust Rate PIDs” P value below the default “0.25” (Try “0.20”). (KK X525 = 0.25)
    b. If your Quad ascends and descends too slowly in Alt Hold mode increase the “Thrust Rate PIDs” P value above the default “0.25” (Try “0.30”).
4. Redo “Altitude Error and Thrust PID - P” adjustments until Altitude is closely maintained.

C. Loiter Mode: (Automatically holds current but manually adjustable position and altitude).

1. When selected, “Loiter” maintains your Quad in the location and at the altitude it is when “Loiter Mode” is selected. The transmitter sticks can override to move the position and altitude set point.
2. In the Mission Planner install “Loiter” flight mode only on the center position of your 3 way mode switch so you can easily switch back to “Stabilize” if needed.
3. To use Loiter mode: wait for GPS and board lock (Both blue LEDs on Solid). Arm and take off and establish a stable hover at 8 to 10 feet and flip the mode switch to the Loiter position.
4. The Quads position should be automatically maintained. (Don’t move the throttle).
5. When done “Loitering” flip the 3 way mode switch to Stabilize mode, take control and land.

D. Adjusting PIDs for Loiter Mode: (Roll pitch and yaw transmitter trim must always be zero).

1. The “Loiter Angular Rate Control PID” P value calculates angle required for speed needed.
    a. If your Quad wanders around too far in Loiter mode increase the “Loiter Angular Rate P” setting above the default “2.4” (Try “2.5”). (KK X525 = 2.4)
    b. If your Quad has oscillations and overshoot in Loiter mode decrease the “Loiter Angular Rate P” setting below the default “2.4” (Try “2.2”).
2. The “Loiter Speed PID” P value calculates angle required to achieve needed speed.
    c. If your Quad wanders around too far in Loiter mode increase the “Loiter Speed P” setting above the default “0.2” (Try “0.250”). (KK X525 = 0.2)
    d. If your Quad seems to continuously over correct in Loiter mode decrease the “Loiter Speed P” setting below the default “0.2” (Try “0.18”).
3. Redo “Loiter Angular Rate and Loiter Speed PID - P” settings until Loiter is solidly maintained.

E. Position Mode: (Position mode is the same as Loiter but with manual throttle.)