LOST LINK/MISSION PROCEDURES

Summary: These procedures outline actions to be taken in the event the UAV loses control link communications with the Ground Control Station (GCS). For these purposes, the term "link" shall refer to the radio link between UAV autopilot and GCS.

Case 1. Loss of Link During Launch

Description:

A typical flight will have the UAV leave the ground under radio control by the Pilot-in-Command (PIC). Upon reaching stable flight, the PIC will activate the switch on the R/C transmitter to enable the UAV autopilot, beginning autonomous flight.

A **loss of link during launch** would be if the PIC could not enable the UAV autopilot and begin autonomous flight.

Action:

In the event of a loss of link during launch, the PIC and spotter will take these actions:

1. PIC will activate switch again to attempt to enable autopilot. Spotter/Assistant will observe GCS to determine if PIC/CIC indicator changes to CIC. If not successful, then:
2. PIC will climb to 200 ft altitude (AGL) and circle, attempting again to activate autopilot. If not successful, then:
3. PIC will switch off autopilot on transmitter, announces "Landing," enter landing pattern and land the UAV.

Case 2. Loss of Link During Autonomous Flight

Description:

After launch, a typical autonomous flight will have the UAV climb to altitude, fly a pre-programmed route, return to a point above the launch site and descend to 200 feet AGL, where it will land under radio control by the Pilot-in-Command (PIC).

A **loss of link during Autonomous Flight** would be if the radio link failed or was obstructed, temporarily or totally, while the UAV was flying its pre-programmed route.

Action:

The UAV does not require the RF link while flying autonomously. The link is used by the UAV to transmit position and airframe data to the GCS, and by the GCS to the UAV for in-flight changes to its pre-programmed flight. If the link is lost, the UAV will end its flight in the return-to-origin mode and auto-land.

In the short-distance flights planned (furthest distance from UAV to GCS would be less than one mile), communications will be line-of-sight. It is unlikely that if the RF link would be lost. If it was lost and it was necessary to recall or reposition the UAV in an emergency (e.g. manned aircraft entered UAV flight area), then:

1. PIC and/or assistant would immediately switch from the omni-directional vertical antenna to the high-gain, directional yagi antenna. This antenna has an additional 13 dB gain, and would provide 200X more RF signal between the UAV and GCS, re-establishing the RF link. If this did not restore the link, then:
2. PIC and/or assistant will immediately notify ATC and Barwick Lafayette airport towers, notifying them of the problem. In addition:
3. PIC will attempt to contact the intruding aircraft on Guard frequency or Unicom (122.8 MHz).

Note that at the time of this application, there has not been a total failure recorded of the RF link in the CropCam UAS.

Case 3. Loss of Link During Recovery

Description:

A typical recovery will have the UAV descend to 200 ft AGL in a large spiral, whereupon the PIC will switch off autopilot on transmitter, announce "Landing," enter landing pattern and land the UAV.

A **loss of link during recovery** would be if the PIC could not turn off the UAV autopilot and assume control under manual R/C flight.

Action:

In the event of a loss of link during recovery and the UAV remains in autonomous control (CIC), the PIC and spotter will take these actions:

1. PIC will activate switch again to attempt to turn off the autopilot. Spotter/Assistant will observe GCS to determine if PIC/CIC indicator changes to PIC. If not successful, then:
2. PIC and spotter will observe that UAV is using its pre-programmed autonomous landing (auto-land) profile. This will cause the UAV to enter a RH pattern, and land into the wind at a shallow, programmed descent angle. This is a feature of the CropCam UAS, but is not typically used in favor of the additional control and softer landing obtained with PIC landing.
3. In the event of a lost link that appears to pose a danger or hazard to other aircraft, the PIC or assistant will phone ATC to report this condition, and follow the procedures they give.