

Attachment 7 Emergency Procedures

The Lepton Avenger utilizes a redundant communication system to ensure contact between the aircraft and the remote pilot. The ground control station provides real-time data regarding aircraft location, altitude and flight characteristics. The pilot constantly monitors the flight information provided to ground control station and through the assistance of a trained observer maintains visual line of sight of the aircraft. In the event of a loss of link between the aircraft and the ground control station, the following procedures are followed:

- **Preflight Actions** - Prior to any flight and as part of the mission preparation, the mission operator will insert appropriate lost link settings to allow the avenger to safely return to predetermine landing location. The settings are stored on the aircraft so that in the event of lost link the Avenger is able to continue operations under autonomous control. The mission operator will identify a safe altitude and location for the aircraft to fly to once lost link has been established. Once aircraft reaches the specific GPS location, it will begin at auto descent and shut off the rotors upon landing
- **In the Air** - The Avenger continuously monitors the status of communication with the ground station. When the Avenger detects a loss of link with the ground station it starts a timer. This timer value (typically 10 seconds) is set by the operator in the mission settings page. When this timer expires the Avenger goes into lost communication mode and will command the vehicle to an operator indicated lost communication waypoint at a predetermined altitude. The aircraft then commands a 2 m/s decent until touchdown. Once aircraft lands aircraft automatically turns the rotators off.

Potential System Failures			
Type of Failure	Sign of Problem	Monitored through Telemetry	Solution
Low Signal Strength	Vehicle is slow to respond to manual commands or PCC commands. A/P terminates steering mode. Audible and warning light alarms	Yes, Signal strength displayed in percentage and packet update rate	Turn A/P on and abandon manual flight. Initiate auto-land
Loss of Communication	A/P terminates manual control, or fails to respond to PCC commands. Audible Comm. alarm and warning light	Yes	The vehicle returns to loss comm waypoint, hovers until elapse of flight timer, then commences auto-land procedure.

Loss of GPS	First indication is poor altitude hold performance, also poor position hold during hover	Yes, indicated by number of satellites tracked and GPS Quality PDOP	Assume manual control of aircraft and land.
Low Power Avionics	System voltage warning audible and warning light	Yes	Land immediately
Low Power Actuators	Lower than nominal voltage displayed	Yes	Land Immediately
Generator Failure	Actuator or system voltages begin to fall	Yes	Land when battery indicator indicates low levels. N
Engine Failure	Noise level or RPM changes, engine loses power	Yes, monitored by rotor RPM thru the RPM sensor	Return and land immediately. If engine dies initiate autorotation procedure
Tail Rotor Failure	Loss of tail control	No	Switch to manual control and initiate autorotation procedure