Attachment 2 Aircraft Type and Model Description

Lepton Avenger

The Avenger is a Small Unmanned Aircraft System s(UAS). The aircraft is an electric helicopter equipped with a sophisticated autopilot and video sensors. The aircraft is operated by a ground control system that includes both a hand-held LCD remote-control and a lot top equipped with a joystick. The fully integrated ground control system provides 3-D flight training, GPS way point navigation, the ability to set max/main altitudes, and the ability to segregate no-fly zones.
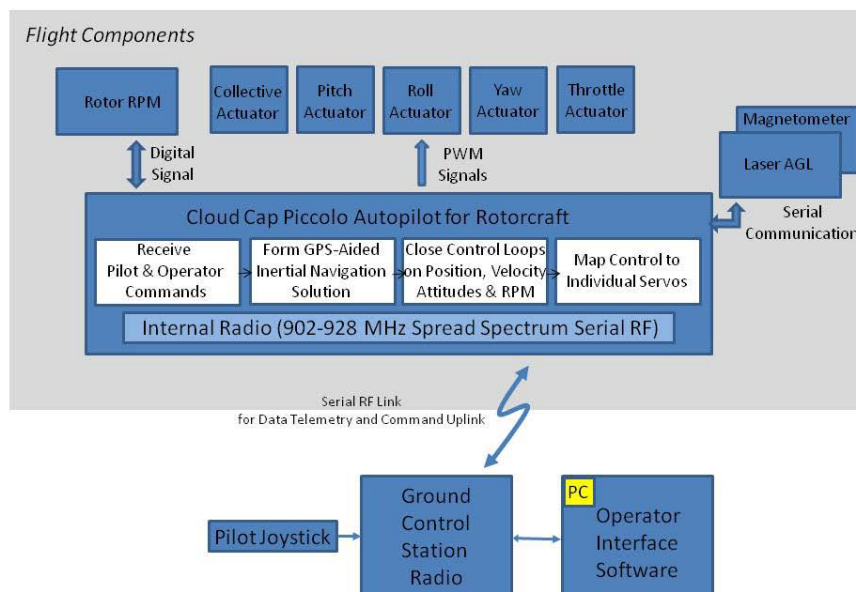
The Avenger can launch, flight a mission, and recover an fully autonomous mode. Situation awareness for the remote pilot is obtained through train mapping features, GPS input to include location, altitude and speed, endurance information and aircraft attitude information. To autopilot stabilization, the pilot is responsible for establishing and monitoring a flight plan. If necessary, the pilot may take over manual control of the aircraft.

The aircraft utilizes redundant communication systems through Spread Spectrum serial radios 2.4 GHz (902-928 MHz). The aircraft has a standard endurance of 20 minutes and a two-mile standard range. The aircraft weighs 11 pounds, is 19.75 inches high and 58 inches long.

The aircraft does not utilize Certified TSO Components.

The Aircraft Control Systems:

The following schematic sets forth the integration of the aircraft, autopilot and control station.

The autopilot for the flight test vehicles consists of the Cloud Cap Technology Avenger SL Autopilot. The commercial off-the-shelf Avenger autopilot system for rotorcraft provides fully automated flight operations, including take-off, waypoint following, and landing, and also modes

for direct and stabilized remote control piloting. The flight portion of the system consists of the proven Avenger hardware set with integrated microprocessor, sensor suite, and spread spectrum serial radio transceiver. The processor employed is the Motorola 555. The internal sensor suite consists of a GPS receiver and a three-axes set of both rate sensors and accelerometers to produce a GPS-aided inertial navigation solution. Also available are a set of pressure transducers for determining altitude and airspeed, but these are not employed on a standard helicopter. The rotorcraft solution requires an external 3 axes magnetometer to determine magnetic heading, and sensing of rotor or engine RPM. For automatic take-off and landing, the system also normally employs an external laser altimeter to measure height above ground. The flight system requires a GPS antenna, and a data link antenna. The system can be piloted manually via a standard joystick interface, or can be tasked by a ground station operator to perform in a fully automated manner.

The Ground Control Systems:

The ground hardware employed includes a small suitcase referred to as the ground control station or GCS. The GCS has its own microprocessor dedicated to management of communications with the vehicle. A standard JR 2.4 GHz hand-held radio interface for remote control piloting is attached to the GCS with a "trainer" cable or wirelessly. The GCS also has a GPS receiver so that the location of the GCS can be properly located on map displays. When selected as a specific hardware option, this receiver can also be used to provide the vehicle with differential GPS corrections. The GCS normally runs from a 120 V AC power input, or a 12V DC input, and has an internal battery backup system. The GCS also requires a GPS antenna, and a data link antenna. The system is managed by an operator with a laptop computer connected serially to the GCS and running application software known as the Avenger Command Center. This software enables the operator to plan and store missions, to configure the vehicle sensors, actuators and control system, to monitor mission execution and system health, to display the vehicle state on various map and photo overlays, and to store the telemetry data to disk. Because the communications are managed by the GCS, and not the application software employed by the operator on a PC, the PC, which may also be running other application software, can become corrupted and be rebooted without disrupting the flight operation. It is also possible in this design for multiple copies of the Command Center to be running on multiple PCs, all networked together, and for all of them to share vehicle data and potentially issue commands to the vehicle.