



USENSE-X8 UAV

Technical specifications



General system description

The USENSE-X8 UAV is a small autonomous fixed wing for aerial mapping. The autopilot system is based on open-source technology and committed to civilian and scientific use. Its specific design allows for flexible operation and can be deployed safely in different environments and weather conditions. Main applications include - Photogrammetry - Precision Agriculture - Research - Environmental Survey – Search and Rescue – News reporting – etc...

UAV-based image acquisition commonly results in hundreds of very high resolution small footprint images. These require image processing with dedicated software for 3D reconstruction and subsequent orthomosaicking and can be visualised in Google Earth or another Geographic Information System (GIS) for further analysis.



Figure 1. Orthomosaic (left) and Digital Elevation Model (right) based on imagery acquired from the USENSE-X8 UAV

The USENSE-X8 UAV system consists of (i) Airframe, (ii) Radio Control system, (iii) Autopilot, (iv) Telemetry, (v) Camera and (vi) Groundstation.



Figure 2. USENSE- X8 UAV components

Technical specifications

Airframe

| | |
|-----------------|---|
| Material | EPO foam, Strengthened with carbon tubes and laminating cover |
| Weight | 3kg (incl. battery and camera) |
| Max Weight | 4kg |
| Dimensions | 215 x 90 x 25cm (Width x Length x Height) |
| Wing area | 80dm ² |
| Cruising Speed | 12m/s |
| Max Speed | 35m/s |
| Endurance | 30-45min (depending on altitude/wind) |
| Flight altitude | 100-200m (Above Ground Level) |

RC-system

| | |
|--------------|---------------------------|
| Manual Range | 1000m |
| Frequency | 2.4 GHZ |
| Options | Failsafe, Basic Telemetry |

Autopilot

| | |
|-------------------|--|
| Type | Ardupilot APM2.5 |
| Modes | Manual, Stabilize, Return-to-launch, Auto |
| Waypoints | Unlimited |
| Included sensors | GPS, IMU, Magnetometer, Airspeed sensor, Voltage sensor, Barometer |
| Logging frequency | 10Hz |
| Autopilot Range | Unlimited |
| Options | Manual PID tuning, Fail-safe, Camera triggering |

Telemetry

| | |
|-----------------|---------------------------------|
| Telemetry Range | 1500m (can be extended to 10km) |
| Frequency | 433 or 915 Mhz |
| Transmit power | Tuneable, up to 20dBm (100mW) |
| Air data rate | 250kbps |

Camera

| | |
|-----------------|--|
| Megapixels | 12MP |
| Swath (at 150m) | 200m |
| Options | Geotagging, Automatic or Interval triggering |

Ground station

| | |
|------------------|---|
| Operating System | Windows |
| Software | ArduPilotMega Planner Vx.x |
| Options | Mission Planning, PID tuning, Flight analysis and Live flight data monitoring |

Safety control

The USENSE-X8 UAV system has been thoroughly tested in various environments and windy conditions (up to 7m/s). During the operation the autopilot system ensures a straight flight pattern at constant speed over the targeted area. At all times manual control can be regained in case of emergency. Two additional safety modules are integrated: Geofencing, which prevents the UAV system to fly outside the predefined target area and the fail-safe mode which in case the telemetry link is lost, returns the plane back to the home position. To power up the UAV system, two 5000mAH battery packs and a multicharger are included. Specific safety measures are taken to assure safe storage and charging of the batteries.
