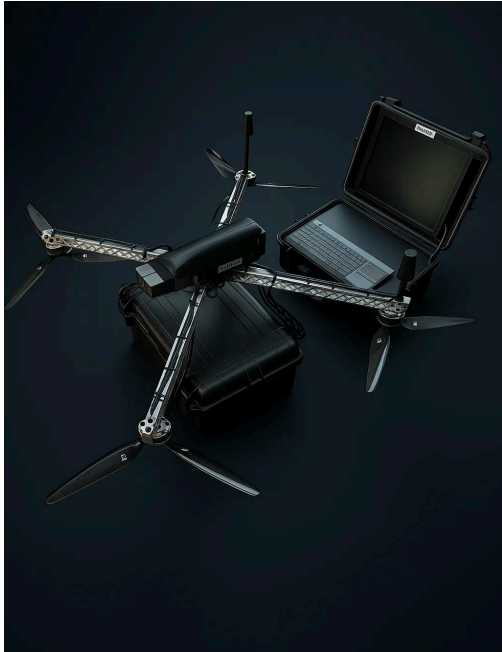


Flaperon Technical Specifications Summary

The Flaperon system includes a GNSS base station as standard equipment, enabling positioning during flight with at least 1 cm accuracy.



The flight control system is integrated with the LiDAR-camera system, allowing point cloud and photo georeferencing during the flight.

This ensures that the system operator can maintain stable data quality during the flight. Accuracy can be further enhanced by replacing sensor modules according to project requirements.

Capabilities:

- Georeferenced colored .las and .pcd format XYZRGB+intensity point cloud
- Post-flight point cloud filtering (automatic)
- Real-time point cloud transmission and visualization for the operator
- Simulator software with drone, camera and LiDAR support (Gazebo based)
- RGB point cloud-based orthophoto (automatic)
- Project-based data management software (automatic)
- Colored point cloud in .las and .pcd format XYZRGB+intensity (automatic)

Planned:

- 5mm resolution point cloud at 5m distance with 50% reflectance (currently +/- 30mm)
- SLAM support to improve accuracy in GNSS-limited areas
- Georeferenced photos with measurement system (automatic)
- Photo-based point cloud segmentation for machine learning (automatic)
- LiDAR-based braking system for the drone (automatic obstacle avoidance)

Technical Specifications Overview:

<u>Category</u>	<u>Specification</u>
<u>GNSS Specs</u>	
GNSS Frequencies	GPS: L1, L2 Galileo: E1, E5b GLONASS: L1, L2 Beidou: B1, B2, B3 QZSS: L1C/A, L1C/B, L2 SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM (L1)
Attitude Accuracy	0.15° heading (1m antenna separation) 0.25° pitch/roll (1m antenna separation) 0.03° heading (5m antenna separation) 0.05° pitch/roll (5m antenna separation)
Positioning Accuracy	Horizontal: 0.6 cm + 0.5 ppm (RTK mode) Vertical: 1.0 cm + 1 ppm (RTK mode)
Time Precision	xPPS out: 5 ns Event accuracy: < 20 ns
Data Rate	Measurements: 100 Hz RTK + Attitude: 20 Hz
<u>IMU Specs</u>	
Noise	Gyroscope: 2.8 mdps/√Hz Accelerometer AX/Y: 70 µg/√Hz Accelerometer AX/Z: 65 µg/√Hz
Range	Gyroscope: ±15.6/31.2/62.5/125/250/500/1000/2000 dps Accelerometer: ±2/4/8/16 g
Output Data Rate & Sample Synch	32 kHz; RTC
<u>LiDAR</u>	
<u>Option 1 (Inspection)</u>	
Technology	Time of Flight, Spinning 360°
Channels:	32
Angular Resolution:	0.1° to 0.4°
Frame Rate	5 Hz to 20 Hz
Wavelength	903 nm
Range	200 m

Range Accuracy	Up to ± 3 cm
Range Precision	1 cm
Rate	600,000 points per second
<u>Option 2 (Mapping)</u>	
Technology	Time of Flight, Spinning 360°
Channels	32
Angular Resolution	0.09° to 0.36°
Frame Rate	5 Hz to 20 Hz
Wavelength	905 nm
Range	120 m
Range Accuracy	Up to ± 1 cm
Range Precision	0.5 cm
Rate	640,000 points per second
<u>Thermal Camera</u>	
<u>Option 1</u>	
Technology	Uncooled VOx Microbolometer, Radiometric
Resolution	160 × 120 pixels
FOV	57°
Radiometric Pixel Size	12 μ m
Thermal Sensitivity	<50 mK (0.050 °C)
Radiometric Accuracy	High Gain: Greater of ± 5 °C (41 °F) or 5%
Low Gain	Greater of ± 10 °C (50 °F) or 10%
Spectral Range	Longwave Infrared, 8 μ m to 14 μ m
Frame Rate	8.7 Hz
<u>Option 2</u>	
Technology	Uncooled Infrared Focal Plane Detection
Resolution	384 x 288 pixels
Temperature Range	-20 °C ~ 400 °C
Temperature Measurement Accuracy	± 3 °C or $\pm 3\%$

Lens	Germanium, 13 mm
Working Wavelength Range	8 – 14 μm
Cell Spacing	17 μm
NETD	$\leq 60 \text{ mK}$
Frame Rate	25 Hz
<u>RGB Camera</u>	
Wide Angle Camera	
FOV	120°(D) x 102°(H) x 67°(V)
Resolution	4608 x 2592 pixels (12 MP)
Video	2304 x 1296 @30fps HDR
Pixel Size	1.4 μm x 1.4 μm
<u>Optional High Definition Camera</u>	
FOV	84°(D) x 68°(H) x 56°(V)
Resolution	9248 x 6944 pixels (64 MP)
Video	2312 x 1736 @30fps
Pixel Size	1.008 μm x 1.008 μm
<u>Optional RGB Pointcloud Coloring Camera</u>	
FOV	120°(D) x 102°(H) x 67°(V)
Resolution	1280 x 800@120fps
Shutter type	Rolling Shutter
<u>Output Data Format</u>	
Pointcloud	• Filtered and merged .pcd and .las • Metafile with CRS EPSG code
<u>Optional</u>	• Raw .pcd files, 2M points per file • Raw .txt ASCII
Photos	• .jpg, 1 sec interval • Metafile with drone positions and orientations, 1 row per image • Intrinsic, extrinsic calibration .xml-s