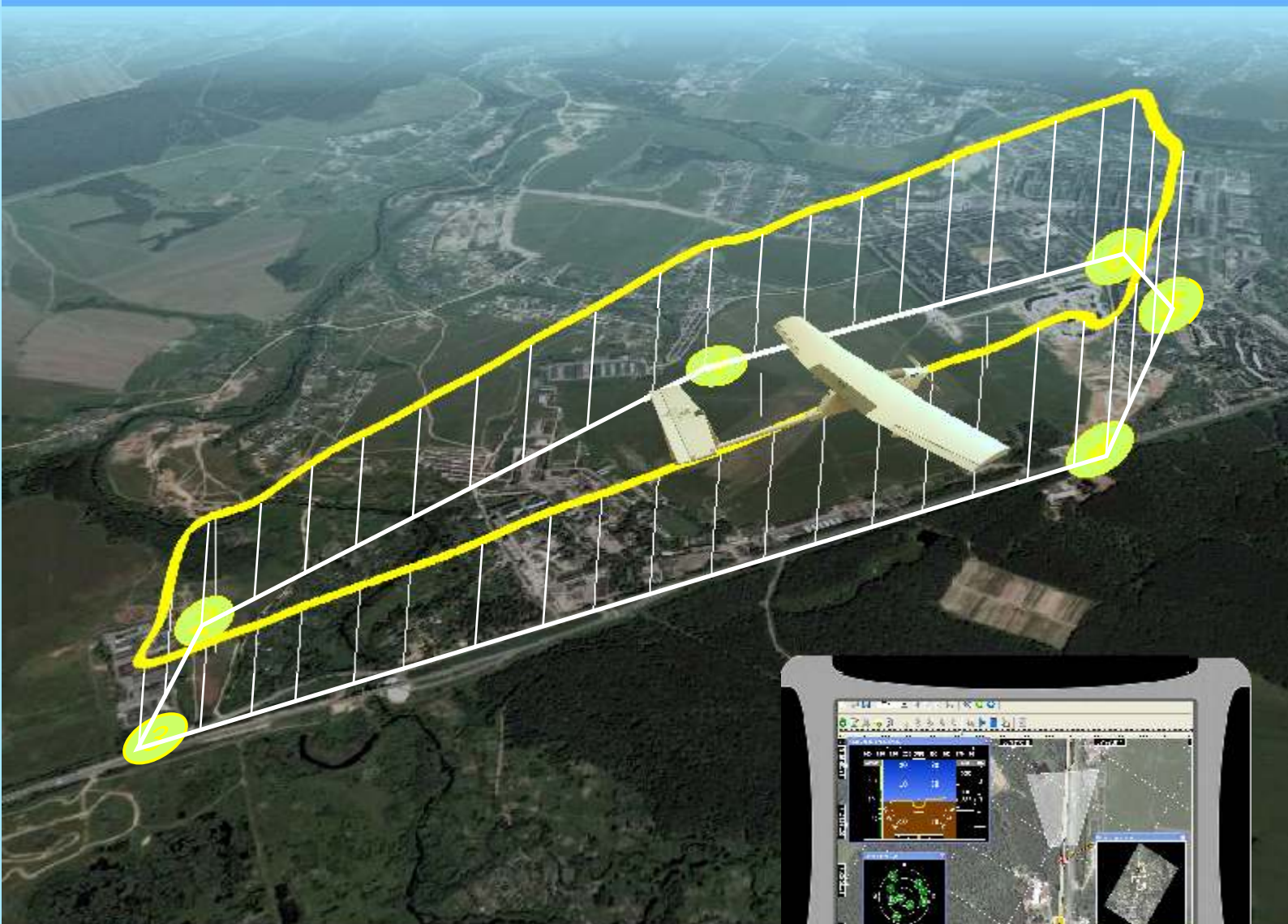


# UAV Flight Control System



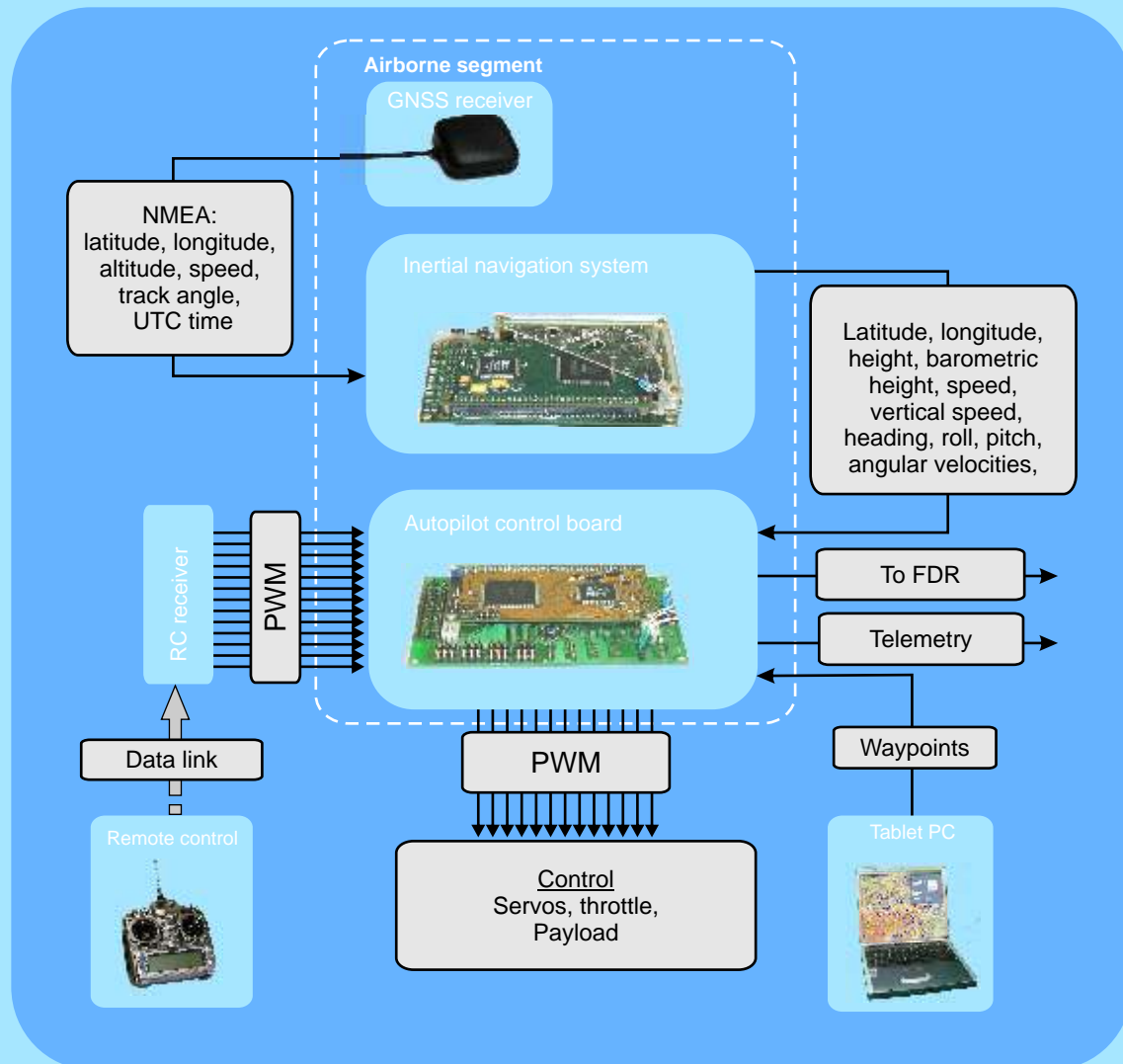
- INS/GNSS integrated system;
- Fully autonomous flight according programmed flight plan;
- Automatic take-off and landing;
- Safe flight in windy conditions;
- UAV angular attitude stabilization;
- Camera stabilization;
- Telemetry data output (flight data and payload state);
- Out of view autonomous flight;
- In-flight flight plan modification;
- Payload programmed control;
- UAV flight data recording;
- Minimal staff qualification requirements.



# System Architecture

## Airborne segment

- Inertial Navigation System
- GNSS receiver (GPS or GLONASS)
- Autopilot control board
- Flight data storage (optional)
- Airspeed sensor (optional)



## Architecture

Basic system configuration comprises four control channels:

- Ailerons
- Elevator
- Rudder
- Throttle

Manufacturer provides autopilot reconfiguration to different control schemes according to user requirements specification.

## Compatibility

Flight Control System is compatible with remote control radio channel (pulse-code modulation) and provides UAV pilot controlled flight and autonomous flight (autopilot mode).

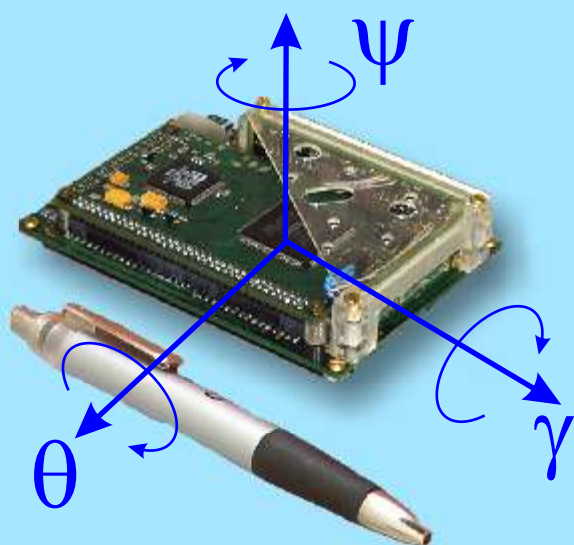
Autopilot control messages are standard PWM signals applicable to multiple servos.

# Specification

<b>Physical</b>		
<b>Dimensions</b>		
Autopilot board	mm	80 x 47 x 10
INS board	mm	98 x 70 x 21
GNSS receiver	mm	30 x 30 x 10
<b>Weight</b>		
Autopilot board	kg	0,120
INS board	kg	0,160
GNSS receiver	kg	0,03
<b>Electrical</b>		
Input voltage	V	10...27
Power consumption (max)	W	5
<b>Environment</b>		
Temperature	°C	-40...+70
Vibration/shock	g	10
<b>Control</b>		
Rs232 port	2	data input/output, external devices connection control devices
Rs422 port	5	
PDM channels	12	
Preprogrammed waypoints	255	
<b>Operating range</b>		
Roll	±180°	
Pitch	± 90°	
Heading	0...360°	
Acceleration	±10 g	
Angular rate	±150 °/sec (300 °/sec optional)	

## INS/GNSS integrated system

Vital part of the airborne segment is ultra-compact Inertial Navigation System (INS) integrated with GNSS receiver. INS incorporates MEMS sensors (gyros and accelerometers) and implements strapdown system principles. INS guarantees high performance navigation, stabilization and control solution for any type of the UAV. Built-in static pressure sensor provides agile altitude and vertical speed calculation.

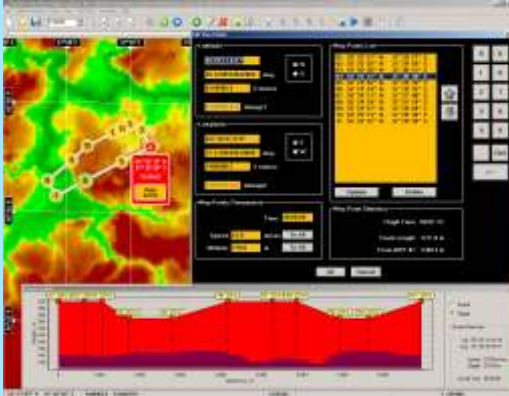


<b>Performance</b>	<b>INS/GNSS integrated</b>
Position	6 m
Altitude	2 m
Vertical speed	0,25 m/s
Attitude angles	1...1,3°
Track angle	1°

Table values are given mean root square (1 ), defined in flight tests with respect to reference navigation system.

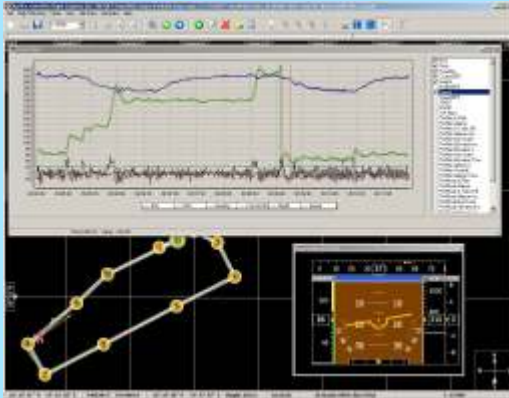
# Mission planning and analysis

The Flight Control System is supplied with software designed to the autopilot parameters adjustment, mission planning and flight data analysis. Program operates with all types of raster terrain images (aerial photos, scanned maps). Map georeferencing is simple and requires two or more reference points coordinates input.



The autopilot allows up to 255 programmed waypoints (WP) storage. WP is specified by its coordinates, flight height and flight speed. WP can be set either by click at desired point at the digital map or by WP coordinates input.

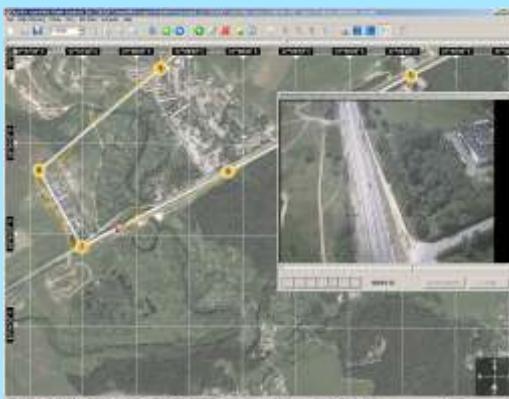
Software displays trajectory development (waypoints height and speed profile), calculates track time and distance between the current WP and the initial WP.



Mission planning and autopilot programming is performed in advance as well as directly in the field before the flight. Software provides in-flight flight plan check and modification. Autopilot is connected to the computer via COM port (Rs232 protocol).



While flying, telemetry data transmitted from the system is displayed at the computer screen. Navigation data is displayed against moving map background. Flight data is visualized at standard gauges. Digital terrain map is displayed as 3D color image. If video receiver is connected, real time onboard camera video data is displayed.



Flight data storage is capable to store about 30 hours of 50Hz data.

The data storage data is used for:

- flight trajectory restore;
- waypoints profile display;
- flight playback in accordance with INS data;
- flight data plotting.

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