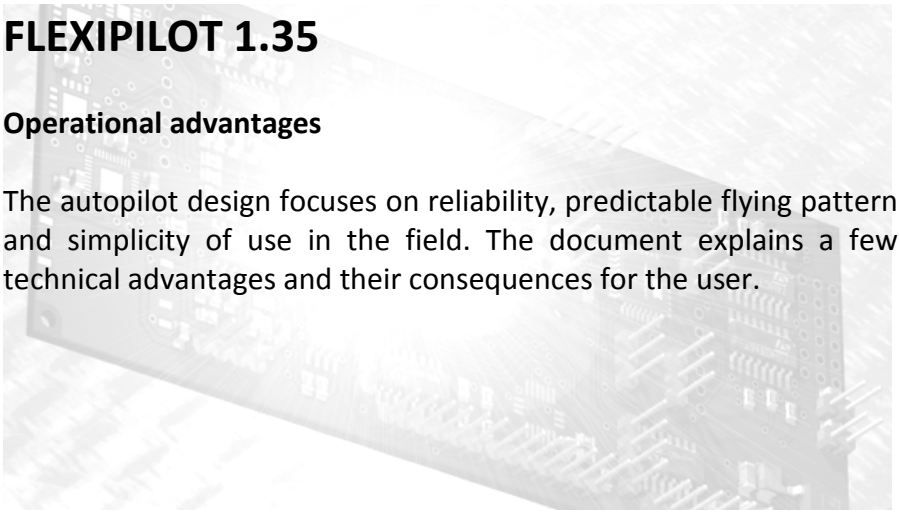
Aerial Robotics

FLEXIPILOT 1.35

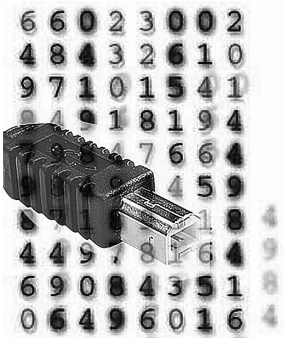


Operational advantages

The autopilot design focuses on reliability, predictable flying pattern and simplicity of use in the field. The document explains a few technical advantages and their consequences for the user.

Navigational agility:

You can fly tighter patterns because in our autopilot the GPS data is enhanced with IMU at 20Hz, working at much higher update rate than the GPS. As a result, even using moderately agile plane like rudder+elevator motor glider, you can obtain tighter turns. You will not need anymore to define legs longer than visual range.



Onboard logging with fast download rates:

Using full-speed USB and data compression, you can download up to 4MB of data in about 2 minutes. This corresponds to more than 2h of data from 131 parameters collected at 1Hz rate. Logging rates up to 20Hz are possible.

Contrary to the solutions using detachable memory cards, you are sure the data connection will never be interrupted and that the communication will not stall even in vibrating, dirty environment. The logging chip and its data is recoverable by our laboratories even from a destroyed autopilot PCB.

You can but you don't have to use wireless telemetry, as it could fail to provide the data when the aircraft is far away and banked.

Self-calibrating barometric pressure sensor:

The system has blinking LED indicating that the pressure sensor has calibrated to the ground level (it takes around 15s). Therefore you program your waypoint altitudes relative to takeoff point height.

No longer need to manually enter local elevation in order to adjust for local pressure changes, every hour or every takeoff.

12.45678N?
134.98765W?

dX=1.2km!
dY=-0.42km!

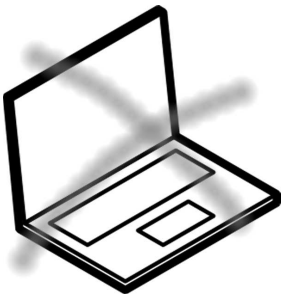
Intuitive relative coordinates system, program once for many flights:

Planning the flight of the UAV can be very time consuming when using absolute coordinates. How far is given position from takeoff point? What are the distances? How to enlarge the whole pattern by 130%? All those actions require importing maps, recalculating coordinates…

This autopilot allows defining the coordinates relative to fixed home location or to takeoff position, whatever will it be. You can use relative Cartesian coordinates in kilometers (floating point accuracy), or using pairs (heading, distance).

You can also use 'incremental waypoint' style,
defining heading and course relative to the last waypoint.

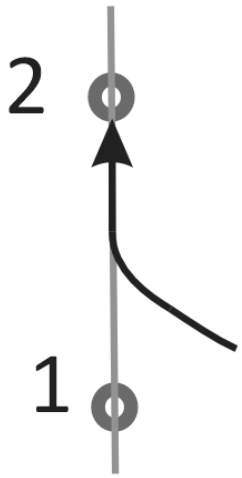
Whatever is your flight pattern, mission simulation performed by the autopilot itself will display the mission geometry.



Possible operation without the ground station:

Thanks to relative coordinates and long logging time you can fly many times at different locations, without using your laptop even once.

Every takeoff is detected automatically and the logging of a new session begins.

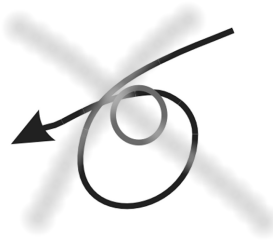


Track-following:

The autopilot provides advanced navigation following the line connecting the waypoints with GPS accuracy + a few meters. The convergence is smooth and takes into account plane turn radius. This feature, coupled with precise triggers measured along track length, allow shooting precisely located series of photos.

You can either enable or disable track-following. Using classic magnet-to-waypoint navigation when the airplane simply heads for the desired waypoint, large deviations from the optimal course occur because of the crosswind, which is never negligible at low flying speeds.

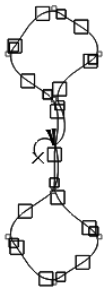
Disabling track following can be beneficial as it minimizes plane reaction; it can lead to smoother video footage at the expense of geographical precision.



No-loiter waypoint logic:
Due to high cross-winds, the naïve implementation of waypoint switching can lead to the situation when the plane never hits the waypoint, or eventually does it after several turns. This can lead to the situation when the plane circles mysteriously on the edge of visual range or manual control. This autopilot is protected against such scenario and guarantees straight-line flight.

Compatible with RVOSD realtime video overlay for telemetry:
Do you need realtime video display? Do you need some basic parameters like altitude, airspeed, positions to be transmitted?
We are closely collaborating with the makers of RVOSD video overlay system capable of sending those data in visual form using standard wireless cameras. Avoid multiplying noisy transmission systems and make video goggles your 'ground station', or use a camcorder for additional flight recording (in the worst case, if you would lose the UAV, you will know not only the coordinates but also the view from the last seconds of fight).

Two independent camera triggers and event log:
Since you mission is likely to be making aerial photos, you need to trigger the cameras in flight. The support for photo triggering needs more than just pressing the button, you must know after the flight where the photos have been taken. The autopilot has separate event log in which the exact GPS time, position, roll, pitch, altitude above takeoff point, course and trigger number are recorded. After the flight, post-processing software will extract GPS-NMEA file with those selected coordinates. Knowing the time stored in your camera, the actual GPS time and using free software, you can match automatically the positions to each photo. This is much easier than trying to match photos to continuous stream of positions.



Mission simulator:
After setting up all the coordinates, you would want to know where the first waypoint is and if you didn't made a mistake entering something from a different hemisphere.
Just run the diagnostic console and perform a simulation by the autopilot itself by issuing a single command. Watch the rudder move, how the trigger servos move and what the expected mission track is. You can use custom wind direction and strength.