AirRails
uaventure

A complete hybrid VTOL autopilot solution. Start anywhere, fly everywhere.

Key Features

Supported Vehicle Types

Hybrid VTOLs	Bi-, tri- and quadcopter tailsitters, quadplanes and tiltrotors.
Multirotors	Quad-, hexa-, octa- and X8 copters.
Fixed-wings	Hand launched fixed-wings.

Supported Autopilot Hardware

Autopilots	Pixhawk, Pixhawk V2.1, Dropix V2, Pixracer, Pixfalcon, AirRails autopilot (coming soon)
Peripherals	UBlox GPS support (RTK coming soon), digital airspeed sensors, PPM remote controls, radar and lidar range finders.
Connectivity to GCS	1 mbit/s UART connection supporting any serial C2 link including direct WiFi (ESP 8662).
Payload	Payload controls via serial and PWM supporting various gimbals and cameras.

Ground Control Station

Tablet based	Android 5+. 9" - 18" tablets, min. resolution 1920 x 1200 resolution.
Operation	Survey, inspection, surveillance and mapping mission planning in 3D, user-based permission levels and central system management.
Connectivity to autopilot	Bluetooth, WiFi 2.4GHz / 5.8GHz, FTDI via USB, 4G/LTE

Flight Support

Modes	Fully autonomous mission, manual and GPS assisted flying modes.
System monitoring	Flight envelope monitoring (detection of stall, excessive roll/pitch, engine failure and more), continuous monitoring of sensors, battery and C2 links.

Flight Control System

The flight control system is a fully-fledged autopilot system supporting various aircraft types and running on a wide range of Pixhawk compatible autopilot hardware.

Flight Modes	
Manual	Manual control (stabilized) for Multirotor/VTOL and Fixed-wing aircrafts.
Altitude Hold	Assisted flying mode allowing manual control but holding altitude and airspeed (Fixed-wing).
Position Hold	Assisted flying mode allowing manual control but holding altitude and position (Multirotor/VTOL) or heading (Fixed-wing).
Mission / Loiter / RTL	Fully autonomous flight mode. See mission features below.

Mission Features	
Takeoff and landing	Fully autonomous. Adapts to the current wind direction.
Speed control	Manually adjust the speed along the mission path at anytime.
Payload triggering	Auto trigger payload (ie: camera) once or multiple times using geo reference, time or distance interval. Manual override possible.
Hybrid VTOL return home	Smart selection of the most efficient mode (multirotor / fixed-wing) to return home and land. All required transitions handled automatically.
Hybrid VTOL transitions	Fully autonomous airspeed based transitions between fixed-wing and multirotor modes.
Hybrid VTOL loiter	Loiter waypoints can be set to circle in fixed-wing mode (efficient) or auto-transition to a multirotor hover.

Vehicle Configuration	
Engine	Electric and fuel engine supported.
VTOL pusher assist	Pusher (and tractor) motor can be used in VTOL configuration to produce forwards thrust, greatly improving stability in wind.
Actuators	Actuator control via PWM.

Safety Features	
Flight envelope monitoring	Detection of stall, excessive roll/pitch, freefall, altitude loss, minimum altitude violation, airspeed loss, motor loss.
Autopilot sensor failover	Sensor failure detection and and failover for redundant sensors.
Battery monitoring	Warnings on low battery and configurable action on critical battery levels.
Datalink monitoring	Link loss detection with optional auto return home triggering.
Motor monitoring	Smart software based motor thrust loss detection or based on RPM sensor if installed.
GPS monitoring	GPS glitch detection and recovery.
Airspeed failure detection	Detection of blocked pitot tubes or complete sensor failures with automatic switch to thrust based flying for efficient and safe return to land.
Hybrid VTOL recovery	Auto failover to multirotor mode on flight envelope violations with optional operator override / retry.
Geofence	Cylinder based geofence. RTL can be enable on fence violation with optional operator override.

Hardware Support	
GPS	UBlox M6, M7, M8. UBlox RTK coming soon.
Airspeed	Digital airspeed sensors (Sensirion, Measurement Specialities, Eagle Tree).
RC	PPM sum and SBUS based remote control systems.
Range finders	Lidars (Lightware range), LidarLite, Aerotenna uLanding.
RPM sensor	Pulsed or analog voltage RPM input.
Precision Landing [Pro]	A UKW or IR LED based precision landing system.
RTK [Pro]	High precision RTK GPS system.

Extras	
Flight Simulator [Pro]	The CQV Typhon[1] flight simulator with hybrid VTOL support for testing and training purposes.

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[1] https://www.comquestventures.com/

Ground Control System

The ground control station has been built with commercial operations in mind. Built on Android to support not just selected consumer tablets but also a wide range of industrial tablets on the market.

Supported Tablets	
General	Android 5+. Bluetooth, WiFi 2.4GHz / 5.8GHz, FTDI via USB. Most 9" - 12" tablets, min. resolution 1920 x 1200 resolution.
Consumer tablets	Samsung Galaxy Tab A 10.1", Pixel C, Nexus 9, Sony Xperia SGP, etc.
Industrial tablets	Panasonic FZ-A2 10" rugged, others on request.

Flight Planning	
Creation	Planning in 2D and altitude adjustment in 3D.
Map types	Hybrid satellite
Library	Save flight plans, grouped by plan type and location. Unlimited plan storage limited only by available local storage. Sync flight plans with the cloud. Share flight plans with a fleet of operators or individuals.
Pre-generated plan templates	Surveys (standard, zamboni, grid with airspeed compensation), circular, square, spiral, vertical survey.
Pre-flight checks	Check for errors or potential vehicle related issues with the flight plan. Automated control surface checks.
Terrain correction Pro	Flight plan altitudes will be adjusted to the terrain. Requires and internet connection.

User Management	
Operator types	4 user selectable password protected operator levels: operator, advanced operator, technician, admin.
Access level	Limited, deactivated or hidden functionality based on the active operator type.
Central credentials management	Passwords set and distributed to tablets from central Fleet Management System.

Flight View (HUD)	

Pre-flight checks	Tablet assisted orientation checks, autopilot system checks, plan validation, airspeed check.
Pre-flight check enforcement	Set ability to cancel, skip or force completion for all or a selection of operator types.
Embedded video Pro	Display live video feeds from onboard cameras via 2.4GHz and 5.8GHz WiFi. Supported formats: H.264 (and more)
3D Flight Plan	Flight plan and live vehicle position visualisation in 3D. Zoom, panning, tilt and rotate the plan.. Live flight plan interaction to alter next waypoint, change speed, etc.
3D base map	3D hybrid satellite base map.
Emergency button	Highly visible emergency button to trigger recovery options.
Onscreen Joysticks	Control payloads (ie: gimbals), flight speed, position via onscreen joysticks.
System Gauges	Radial and bar gauges showing speed, RPM, voltage, current, etc.

System Configuration	
Calibration	Perform gyro, accelerometer, magnetometer, airspeed and leveling calibrations.
Parameters	Modify autopilot parameters.
OTA firmware updates	Autopilot firmware updates via WiFi (requires WiFi enabled autopilot).

Extras	
ADS-B	Integrated ADS-B system provides audio and visual warnings for approaching aircraft. All aircraft in the region shown in 3D. Requires internet connection.
Weather Pro	Enables weather pre-flight checks on a flight plan prior to uploading to the vehicle. Requires internet connection.
Custom data and layers Pro	Upload custom vector data, such as your terrain models or custom tiles for use by your fleet of users when using the GCS.

Flight Logs	
Autopilot Log fetching	Automatically download all log files from the autopilot once vehicle disarms. Fetched logs will be cached on the tablet.
MAVLink logging	All MAVLink traffic received and sent by the tablet will be logged.
Log upload	Upload cached log files to the Fleet Management System automatically once an internet connection becomes available.