

VisioRD – drone control systems

auto antenna and auto camera tracking

Summary

We develop key-turn solutions for drone based inspection and survey services.

- Research & development of drone related mission hard- and software
- Auto antenna- and camera tracking systems for drones
- Mobile mission facility design and realization
- Tuition in drone mission planning and flight control

Product overview:

- Auto antenna- and camera tracking system for drones (various models)
- Mobile mission facility – winter and insect proof
- On- and Off grid camera survey unit for spotting, field facility security, bird watching system, etc..



Solutions

Our solutions are made for : Safer missions, increased efficiency reduced costs

The underlying issues that prompted us to provide solutions are weather conditions, insects, direct sunlight, passengers and none LOS long range issues and working environmental issues leading to lack of concentration over time and shorter mission working days.

Our solutions are aiming at keeping pilots and passengers out of these circumstances while making sure the mission is a safe mission.

Our solution contribute to

- 🌐 **improved safety. Less distraction, better traceability of the drone via camera and improved signal**
- 🌐 **more efficient workflow**
- 🌐 **increased action radius**
- 🌐 **improved working environment**
- 🌐 **total costs are reduced.**

Solution details

1. **Auto-(antenna) tracking** the drone as far as possible with directional antennas. What pilots already do when turning towards the drone while flying, the automatic tracking becomes the more efficient solution when it comes to none LOS or/and long range missions. Automatic antenna tracking solutions are currently available for some DJI drones including the matrice 300 RTK.
How it works?
Drones are sending telemetry data to the remote controller. A software is reading out this data from the data stream and calculates a vector. This vector is then sent to a pan/tilt unit that moves the antennas pointing them always towards the drone optimizing the signal to and from the drone. There are more details in this software to be adjusted so that it makes it practical and quick to use.
Regulations on signal strength are to be considered by the operator. However, for drones having a separate antenna for Rx (listening to the drone) on the remote controller is making a big difference to direct the listening antenna ("your ears") directly to the drone.
2. **Camera tracking:**Tracking with human eyes is a limitation and a risk due to the pilot or spotter is still prone to be distracted by mosquitos, direct sunlight or freezing temperatures. **The solution is camera tracking.-** Using the same pan/tilt unit that follows the drone a zoom network camera of high quality (HD or 4k with 30x optical zoom) is placed in between the antennas. Thus, the camera moves along the antennas. The antennas do not move all the time which allows good images with even high zoom level using built-in image stabilization. Usually it is sky and the drone on the images. However, regulations on camera surveillance differ from country to country and it is advised to find out how it works in your specific region.
The camera tracking can be performed in both auto tracking and manual tracking mode with joystick.
3. **Mast mounted:** The best camera will not help if all you can see with it are bushes, trees or vehicles right in front of you.
Further, in order to minimize loss of signal the antennas, camera with the pan/tilt unit can be mounted on a mast. This will help to get over the basic vegetation or other obstacles. We provide masts from 2m vehicle mounted to 20m trailer mounted or custom solutions using a zoom camera
4. **Passenger solutions – protect the pilot and passengers**
The working environmental aspects have not yet reached regulators to the extent they actually should have. Operating a drone for several hours a day requires concentration and back up. It requires good working environment.
We move the pilot, co-pilot and passenger into a room or vehicle. No direct sunlight, no mosquitos, room temperature, a proper passenger scree, chairs with arm rests, mounts for remote controller, etc.

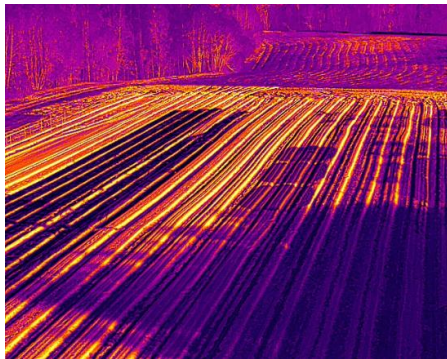
Missions can be planned in the office or mobile office facility, can be discussed with stake holders and performed with passengers such as subject matter experts guiding the mission.

We plan and build small solutions with only the modifications for the remote controller and auto tracking solutions as well as the whole system including vehicle-based mission rooms/office.

If regulations require a spotter can still be engaged as well as back up pilot in the field. Further some regulators require human eye spotting instead of spotting via camera.

The advantage of performing missions from inside a vehicle or room are summarized as:

1. Weather conditions are not affecting the pilot or passenger directly
2. No distraction by mosquitos or noisy, dusty construction sites
3. Changing missions, discussing and planning can be done on the spot
4. Direct sunlight is kept out. Screens can be seen independent of sunlight conditions
5. Passenger can interact with the mission while performing the flight e.g. for guidance purpose



Products and services

We build complete systems comprising hardware and software components based on your specifications. We provide also standard solutions at fair price.

Services are performed in alignment with stake holders. All data can be stored securely within EU.

Hard- and software overview:

- 🌈 Automated camera monitoring and antenna tracking systems for UAVs/drones
- 🌈 Pan/tilt units with absolute positioning including hard- and software controllers
- 🌈 Mobile camera monitoring mast system for on- and off-grid monitoring/surveillance/spotting
- 🌈 Mission office facilities and systems for long working days in the field
- 🌈 Vehicle mounted solutions including 19" rack mobile mission facilities

Typical set up overview for our auto tracking of industrial drones.



Windows software



Power supply and RS485 converter



Joystick controller



Mast control unit



Various mast options from minor staves, vehicle mounted or large mobile masts

Various antenna options with pan-tilt unit

Product and services overview

Auto antenna tracking system

- This includes UGCS software, antenna tracking software (Windows based)
- Pan/tilt unit (option light weight or heavy duty) with quick change mount
- PC interface, cables, power supply, RS485 joystick control unit

Antenna and camera masts

- Tripod base mast 2,5- 3m
- Tripod based pneumatic mast (up to 8m)
- Vehicle mounted mast with mechanism for lifting mast from horizontal parking position to vertical position (up to 4,5m)
- Trailer mounted mobile mast (up to 20m or standard)
- Fixed galvanized steel mast (5m to -)

All masts can be equipped with on- or off-grid power supply solutions.

Antenna options

- Omni directional antennas from 3dbi to ca 12dbi
- Directional antennas with up to 20dbi
- Quick mount bar for antennas and/or camera

Camera options

- Axis network camera P13 or Q16 series as well as explosion proof type
- Camera based on custom requirements

Vehicle or mission room facilities

- Mobile office drone mission rack with various screen options, remote controller mounts, power supply, etc..
- 19" rack options for periphery, power supply (also UPS)
- Rack tables and other furniture
- Vehicle levelling attenuators for up to 4 tons vehicles or trailers

IT infrastructure, periphery options and services

- Modification of remote controller with N-type female connectors (voids warranty)
- High quality low loss antenna cables (such as Highflex 7, Ecoflex, etc..)
- Network camera periphery for off grid solutions such as 24V PoE injectors and industrial 4g routers
- Remote control of mast, camera or pan tilt unit via custom made cable and/or RJ45 network cable
- 19" rack solution for mast control, power supply including UPS and off grid inverters using high quality products
- RS485 joystick control unit for manually controlling the pan/tilt unit

Package solutions

Small scale mobile solution

- 🌐 Auto antenna tracking software and mission software (UGCS software to be paid separately)
- 🌐 Light duty pan/tilt unit with adapters, antenna mounts
- 🌐 Antenna cables (N-connector or RP-SMA)
- 🌐 2 x 14dbi flat panel antenna
- 🌐 2,8m stand for pan tilt unit including adapter for pan/tilt unit

Please contact us for pricing options

Please note that the remote controller modification is not included in this package.

Medium scale mobile solution

All included as in the small scale package with additional options for:

- 🌐 heavy duty high quality pan/tilt unit
- 🌐 rack mounted power supply and control

Please contact us for options and pricing

Large scale solution

The large scale solution is always a custom tailored solution depending on the specifications, missions types, environment and organisational policies.

We try to build custom solutions as much as possible on the standard packages and adapt and build up from there. This can be any specific antenna requirements, camera system, vehicle mounted antennas or cameras as well as mobile rack solutions for the various components.

Contact us with your questions and we will get back to you with answers.

Large scale solutions can include but are not limited to:

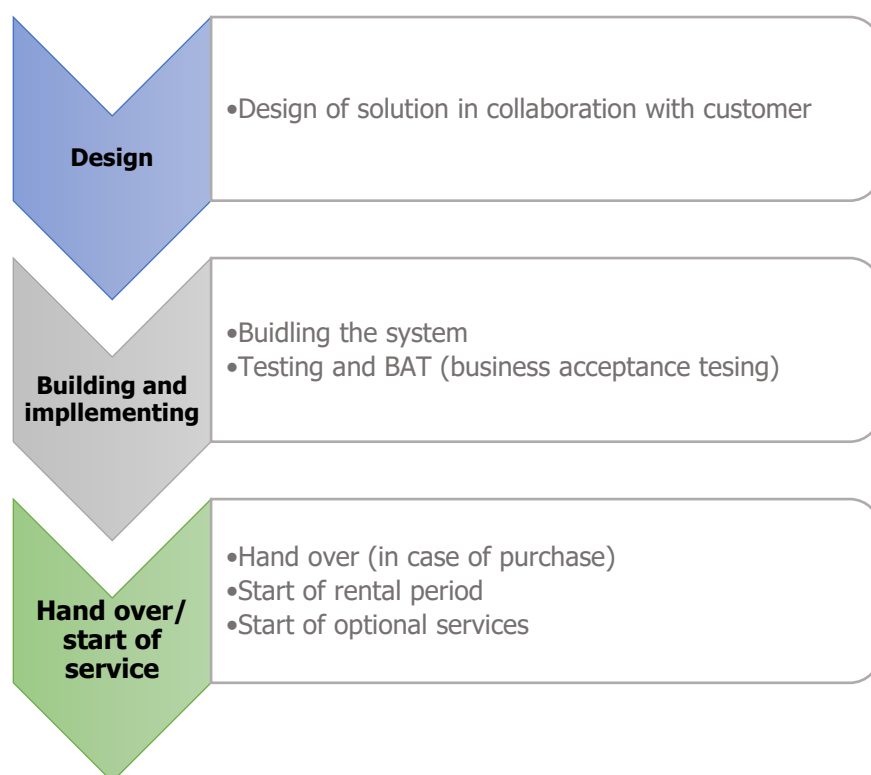
- 🌐 Auto antenna tracking software and mission software
- 🌐 Light or heavy duty pan/tilt unit with adapters, antenna mounts
- 🌐 Antenna cables (N-connector or RP-SMA)
- 🌐 Antennas
- 🌐 Camera including mount, cabling
- 🌐 19" rack mobile solution for vehicles
- 🌐 Monitoring including mounts, monitors, cabling, supply, HDMI matrix, etc..
- 🌐 Ergonomic furniture for pilots and passengers including desk mounts for controllers, etc..
- 🌐 Whole missions station
- 🌐 Installation works in vehicles

Technology

- Mast components up to 20m for mobile masts
- Axis cameras and software as well as 3rd party software
- Industry grade IT components such as chargers, router, batteries, etc...
- High quality pan/tilt units including hard- and software controllers for custom solutions
- Collaboration with partners for custom hardware installations

Process

Once aligned on the specifications we can send an offer. Upon confirmation we will build the system and deliver.



Automated directional UAV antennas

Background information, issues and challenges with drones today

Development in progress..

The potential of UAVs/ drones is yet to be explored. Since several years technology has moved forward and enabled drones to perform an increasing variety of applications for industry, public sector and research. The vehicle itself, the drone, has developed from a pure photographic toy to a photographic tool and further to a “Swiss knife” for surveying, inspection, S&R, surveillance, etc.

An increasing variety of sensors can get airborne and perform the tasks to be done often faster, better and at lower costs than alternatives. The variety of sensors include a wide spectrum of photo cameras, IR, sensors, multispectral, Lidar, Georadar, gas-sensors, etc.. Further tools are in development and a lot more to be expected in the future.

The number of UAVs increases rapidly and regulators are trying to get order into the increasingly dense air-space.

Both US and EU regulators are working on tests and implementing suggestions from the various stake holders. The development is on and cannot be turned off anymore. Being aware of the EU came up with a new legislation regulating usage of UAV within the EU. Similar regulations are implemented in US and other countries.

There are certain technical milestones that opened for new possibilities while same time requires that regulations are considering these possibilities. In most countries in a constructive, encouraging way in order to support the development of these new possibilities.

A major milestone was reached with (almost) real time video transmission in quality sufficient to fly FPV (first person view) where the pilot controls the UAV solely via a screen and the remote controller rather than the remote controller and visual contact to the UAV. This is nothing new. It has been around for some years. However, it is not before 2021 where EU actually implements the possibility to fly out of LOS (line of sight). Still it doesn't fully rely on the technical set up and requires a human eye spotting the UAV at all times.

One could easily figure out that this is a compromise until technical solutions are available safe enough (fail safe) and regulators have got regulations that can handle all these developments made along the way.

In the mean-time some countries allow specific exceptions for specific purpose. This is a step in the right direction as it contributes to better safety while enabling for a market to come with more possibilities for all involved.

Technology- and regulation-wise there are several challenges with the none-LOS certifications as of 2021.

Some of these challenges are depending on the location and weather conditions, some are pure regulation related.

Among more there are some particular challenges we tackle with our solutions:

1. Weather conditions while flying can jeopardize all efforts by regulators, operators and pilots to fly safe:
It is almost impossible to fly during low temperatures for more than 15 minutes without fine motoric movements by the hands are not good enough anymore to fly a drone. We used infra-red heaters to keep the pilot warm enough to fly which is quite an effort in the field and rather irritating. Even when flying automated missions, it sometimes is necessary to take over manually and then the same issue applies.
Often 5 minutes are the limit rather than 15 minutes! New industrial drones are making it 40+ minutes airborne. This was not so important at times where drones “air-time” was low and distance was limited to LOS by the pilot.
2. While dealing with low temperature is a potential halt for your mission, there is another thing to defy during summer months in many places around the globe: Mosquitos and alike. It is simply not practical to be covered fully by a mosquito net while operating a drone. Repellents, mosquito traps or ignoring them is no good option either if the mission is to survey or inspect in such areas.
3. The third major issue which can make a job difficult or even unsafe is being blinded or distracted by direct sunlight. Well aware of that there are goggles and the possibility to make use of another person's eyes for the LOS class/type missions it is still an issue when flying industrial drones with one or two screens packed with

information on telemetry, payload/camera information, obstacle avoidance data, flight awareness, etc..

Goggles are good for flying when other information is not so important for the flight itself.

We tested several brands and some of them do really work well for flying. However, industrial missions differ somewhat from drone racing events.

4. You are not alone! The new possibilities of today's drones open up for interacting with 3rd parties during the flight. E.g. a nature value survey might require guidance of an environmental expert while flying. Due to longer flight times of today's drone there is also the possibility to halt during the flight and discuss further proceedings or make adjustments without having to check the battery level every 60 seconds. We did tests with various set-ups and concluded that a set-up of co-pilot and passenger option is a very efficient way of working certain types of missions.
5. With the for 2021 new possibilities of none-LOS flights there is another challenge where even a spotter cannot help much: radio interference or simply loss of connection to the drone. Some new drones do actually have the possibility to be taken over by another pilot closer to the drone. However, this works only when the mission's planned path is known to the extent of a take-over would make sense. It also increases efforts and costs. For large area surveying, S&R or certain police applications it is highly impractical. The challenge with radio signals for drones is not only the connection as such but the loss of bandwidth for video transmission and sometimes not very predictable signal conditions. Without going into a detailed discussion here, often it is a vegetation and the pilot's place of operation that makes things worse. Finding a suitable spot is sometimes not easy. Sometimes not even possible setting a limit to missions. Antenna wise are certain limits to be kept with the EU to be more restrictive than U.S. However, getting the signal out is often less of a challenge than listen to the faint signal of a drone behind trees.

All these situations can deploy more or less simultaneously.