*Please note this is a draft.

Contestants:

The competition is designed for autonomous flying objects, up to a size of 80cm (the largest distance between any two points, excluding the antenna).

We can only allow drones, i.e.: appliances which can be operated whilst out of sight, hence either fly autonomous with the help of an onboard device and matching sensor technology or are flown and operated by any person using a computer to follow the drone without actually needing to see it.

Exceptions are granted for take off and landing, bar if this is the actual task (e.g. in case of additional award c)

The challenges are designed for helicopter like flying objects, not for airplanes.

The goal of the motodrone event is explicitely to enhance the development of autonomous flying. Thus, any appliances which can only be controlled if within sight, are not allowed to compete.

Conditions of participation:

The competition is open source, which means that all findings (in the form of source code etc.) which are necessary to build and operate the individual appliance have to be presented to the jury. The documentation should be of such standard, that any individual who is reasonably educated in the field can reconstruct the drone. The quality of the documentation will be judged by the jury and the points awarded count towards the final score.

The competition should facilitate the development and support the open source community to foster further development. We can thus not allow commercial (non open source) systems to compete for the money prize. To ensure we mirror the entire development span, we want to welcome commercial competitors though, and will allow them to compete for an honorary award.

Participants will need to hand in the source code, documentation, as well as the BOM, the schematics and the layout for the circuits, which are necessary for each challenge. Naturally, no source code needs to be submitted for of the shelf hardware components, like for example PDA's or other embedded computers (Gumstix or Olimex boards etc.), GPS, and Cameras etc. as far as the products are freely available.

All documentations will be published once the competitions are over and the winner has been announced. Competitors should only use components and materials which are available for everyone, hence can be bought or ordered in any (online) shop. The total construction cost should not surpass €10000,-

Preassabled commercial components with non gpl software/firmware should only be used for extraneous components (e.g. the motor, the remote control, GPS, Camera etc.), must not be used in relevant task solving matters and should be easily replaceable by other similar components . Therefore, applications like a commercial GPS system, which uses an accelerometer and / or a gyroscope to enhance the update frequency; or for example professional IMU (inertial measurement unit) can not be tolerated.

Sensors with an integrated microcontroller are only accepted, if the function of the microcontroller is limited to digitally feeding a sensor signal to an interface (e.g. magnetometer with an i2c bus).

Chassis of commercial flight apparatus can be enhanced with additional features to master the challenges, as long as the previously mentioned rules are followed. E.g.: Helicopters or quadrocopter models with an IMU or another onboard computer are permitted, if the software used complies with the open source criteria mentioned above.

Models which already possess an inbuild IMU or an onboard computer which source can not be traced can not compete unless these parts are replaced by open source components.

All source code and the documentation needed to reconstruct the drone need to be handed in to the jury. Software- and parameter changes which are made just before or during the competition should be submitted before the end of the event on Sunday, 6 pm.

The winner / winning team will be announced in the award ceremony on Sunday. The money prize will only be awarded if after two months no other team has successfully vetoed the victory in terms of proving that the documentation or source code which was submitted is faulty. Should this be the case, the winning team will get a chance to resubmit the documentation.

The event should enhance the open source development and the joy of innovation. The jury will use measurable criteria wherever possible. Naturally documentation and originality in both idea and realisation will be hard to measure in terms pf absolute figures, and it must hence be agreed that the decisions of the jury will stand and can not be vetoed.

Motodrone Challenge:
Award: € 20 000,-

The challenge is divided into several tasks, the score of each will be added together. The team with the most points is the winner. In case the two leading teams have an equal score, a play-off will take place.

The following aspects are essential:

- stable hovering in changing wind conditions
- stable flight between numerous way points
- capturing and focussing on objects with the camera
- stabilising the flight object after an unexpected free fall
- automatic take off and automatic precision landing

Competitors will always get two attempts, the best result will stand. This will allow for last minute enhancements and code corrections.

In order to allow for a precise judgement in some of the tasks, two infrared LEDs need to be installed, one on top of and one underneath the drone, so that the rotation centre is positioned in the middle of these two points. Teams will be advised as to when the LED's need to be turned on.

Task I: Hovering
This challenge will take place in a tent (GPS possible). The drone needs to take off over a white square marked with a red point (diameter: 5cm) and hover one meter above ground. The operator will be outside of the tent without visual contact.

A programmed wind machine will blow for 2:30min. Every competitor will get the same wind profile.
The goal of the challenge is to hold the position as precise as possible.

In each corner of the tent at 1m hight will be placed a quadratic sheet of paper which has 1 square meter. In the center of the paper will be a red point of 10cm diameter. The distance between each sheet and take off point might be around 2m.
The red point at the take off place and the four red points at the corners of the tent has to be focused by the camera for 30s so that the red point keeps in the center of the video as precise as possible.

Evaluation / Score sheet:

Automatic take off: 4 points
Manual take off: 0 points
Find the red points and keep them in the center of the video automatically: 3 points
manually adjusting the camera: 1 point

Points for stable hovering will be given out according to the rank:
The team with the best result will get 12 points.
2nd place: 8 points
3rd place: 4 points

Points for camera stability will be given out in an equal manner:
Best result: 6 points
2nd place: 4 points
3rd place: 2 points

Points for exact landing will be awarded in terms of distance from the starting point:
Automatic landing: 12 minus one point for every 10cm distance from take off position
Manual landing: 12 minus one point for every 5cm distance from take off position

Task II: non gps position hold
This task is similar to task I, but will take place inside a large room (GPS not possible).
The goal is to hover in a position, one meter above the starting point and stay as still as possible. A wind machine will project a wind profile for 60 seconds. The drone should then land as close to its take off position as possible.

All necessary sensor equipment must be carried by the drone. External aids such as IR-beacons, optical marks or radio systems are not permitted. Easily (visually) recognized objects will not be put in place. The distance to the walls is not set, and might be rather large.

Evaluation / Score sheet:
The evaluation of the hovering stability will be in the same manner as above (Task I):

Automatic take off: 4 points
Manual take off: 0 points

Points for stable hovering will be given out according to the rank:
The team with the best result will get 12 points.
2nd place: 8 points
3rd place: 4 points

Points for exact landing will be awarded in terms of distance from the starting point:
Automatic landing: 12 - one point for each decimeter (distance from starting point)
Manual landing: 12- one point for every 5cm (distance from starting point)

Task III: Waypoints
Starting at any given take off point the goal is to fly through five gates, which will be located on different heights. The gates are squared and have an edge length of 2m. Four of these gates will be located outside; one gate will be inside a room (no GPS possible). To complete the task, the drone should land on its starting position.

Some gates might not be reached on a direct way, as obstacles will be put in place.There will, however, always be a corridor of min. 2 diameters.

The position of the gates should be determined by any reliable method put forward by each team. The obstacles will be fixed and reflects light as well as sound. The gates and obstacles can be examined prior to the challenge, e.g. to measure GPS coordinates or the positions and alignments.

Evaluation / Score sheet:

Automatic take off: 4 points
Manual take off: 0 points

Flying through each gate:
automatic: 5 points / per gate
manually: 2 points / per gate

Points for exact landing will be awarded in terms of distance from the starting point:
Automatic landing: 12 minus one point for every 10cm distance from starting point
Manual landing: 12 minus one point for every 5cm distance from starting point

Task IV: Stabilising the flight object after an unexpected free fall
The drone will be placed in an undefined manner and hight, and then dropped within 60s after the drones operator signalled “go”. The goal of this challenge is to stabilise the drone as quick as possible, to stop the downward motion.

This scenario will be filmed by a static camera and the efficiency will be measured in terms of lowest point reached until the stable position is found.

Evaluation / Score sheet:
Quickest recovery: 15 points
2nd place: 10 points
3rd place: 5 points

Special Awards

1. Smallest AFO
2. most inspiring night performance
3. automatic landing on a docking station with inbuild charger