



**droniada**

**REGULATIONS OF THE  
DRONIADA GZM TECHNOLOGY COMPETITION 2022**

Foundation Micromakro Institute  
Muchowiec airport, Katowice, Metropolis GZM,  
June 25 - June 30, 2022

Version 3.0

**JUNE 2022**

## UWAGA!

Here is the current version of the regulations of the Droniada GZM technology competition available on the website [droniada.eu](http://droniada.eu). Registered teams will also be notified of changes via email, WhatsApp and via the contest profile @droniadacc.

Incidentally, we use the terms UAV – unmanned aerial vehicle alternately; unmanned aerial vehicle; UAS - unmanned aerial system and above all drone, treating it as a signum temporis with the indication of the latter term.

In all competitions, the priority is the safety of participants (teams) and spectators (i.e. observers). They are obliged to strictly comply with these regulations, including the instructions of the Organizers and the Flight Director appointed by them.

The organizers trust that the competitors will act in accordance with the principles of fair play, in the spirit of sports competition, while taking care of the safety of all participants. In the event, however, that the competitor repeatedly violates the regulations, including in particular the safety rules, the Organizers and the judges appointed by them have the right to disqualify the participant or the team and order him to immediately leave the competition area. Observers are subject to the same rigor. Disqualification applies within the competition or entire competition.

The competition is not subject to the requirements of the Act of 20 March 2009 on the safety of mass events due to the planned number of participants and the limited availability of the Silesian Aero Club to the public. However, the Organizers declare that in the organization of the competition they will use the provisions of the Act to increase safety. This also applies to any orders related to the epidemic situation in the country.

The organizers encourage readers of this document to notify them of logical inconsistencies, errors or gaps in the rules encountered.



THE AIM OF DRONIADA IS TO PREPARE INNOVATORS  
TO WORK WITH INDUSTRY 4.0 TECHNOLOGIES.

AT THE SAME TIME, IT IS A TRAINING ON HOW TO RUN YOUR OWN COMPANY,  
BUILD A TEAM AND SHAPE "SOFT" AND "HARD" COMPETENCES.

PARTICIPATION IN DRONIADA IS A "COMBAT TEST", CASTING AND GUILD MASTERPIECE THAT  
ALLOWS ENTREPRENEURS AND PUBLIC INSTITUTIONS TO CHOOSE TALENTED EMPLOYEES AND  
BUSINESS PARTNERS. BUT AT THE SAME TIME, THE COMPETITION MAKES IT POSSIBLE TO TEST  
THE POSSIBILITIES OF INDUSTRY 4.0 TECHNOLOGY, ESPECIALLY IN THE FIELD OF ENVIRONMENTAL  
PROTECTION, CONSTRUCTION, PRECISION FARMING, CRISIS MANAGEMENT AND PUBLIC SAFETY.

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## 1. General principles

Droniada since 2014 allows you to show your competence in the field of industry 4.0 technology, with particular emphasis on drones, ICT and information analysis systems. We create a community that promotes the achievements of digital transformation and industry 4.0.

1. The underlying technology is remote sensing in competitions related to leading sectors: smart agriculture (precision farming), environmental protection, construction and crisis management. In addition, we promote machine learning, the Internet of Things and cloud computing.
2. We prototype solutions that can be used in the economy.
3. We popularize robotics in agriculture, environmental protection, construction and crisis management.
4. We stimulate the digital economy by presenting drones as elements of complex Internet of Things (IoT) systems.
5. We promote the fusion of information in the field of combining satellite imagery with data obtained from drones and other data sources
6. We develop the staff of industry 4.0.
7. We are inspired by each other with ideas for technological solutions.

The competition is attended by academic teams, open teams and individual participants who are able to combine knowledge from robotics, ICT, geoinformation, electronics and aviation. We are truly aware of the competences of industry 4.0 staff in the conditions of sports competition, we learn about various ways to solve the problems posed and assess the capabilities of unmanned systems in providing real value to the end user.

This year's competition is organized in the formula of multidisciplinary sports competitions. During the Olympic Games, athletes who specialize, for example, in swimming on the back, archery or cross-country running meet. Only a few compete in the modern pentathlon or the athletics decathlon. They are united by the spirit of sporting combat and the national medal classification. With that in mind – after eight years of organizing drone triathlons – we decided it was time to change the formula.

Participants have a choice of five competitors and focused on a practical demonstration of the capabilities of autonomous systems, of which only one – the Demo of the Unmanned Aerial Vehicle system – is mandatory for everyone. In the general classification we will include the results of teams just like the countries at the Olympics.

Participants fight for honorary prizes, material prizes, paid internships, but also for cash prizes, which we assign to individual competitions. In 2022, the prize pool is PLN 50,000, i.e. about EUR 11,000. The condition for receiving financial prizes is to obtain at least 60% of points, i.e. 6/10 points in the "Demo of the BSP system" competition, 60/100 points in the "Relay", 30/50 points in the "Tree of Life", 21/35 points in the "Intruder" and respectively 33/55 points or 39/65 points in the "Construction".

## 1. Organizers, partners and judges

The main organizers:

"Mikromakro Institute" Foundation with its registered office in Warsaw (address: Al. Komisji Edukacji Narodowej 36/112b, 02-797 Warsaw), entered into the register of associations, other social and professional organizations, foundations and independent public health care institutions and the register of entrepreneurs of the National Court Register kept by the District Court for the Capital City of Warsaw in Warsaw XIII Commercial Department of the National Court Register under KRS number 0000337473, NIP 9512293688, REGON 142025412, hereinafter referred to as the "Organizer" or "FIM".

The Mikromakro Institute Foundation creates the Droniada and Droniada TV Organizational Office to handle the competition. The list of honorary patronages, partners and co-organizers is successively made public on the Droniada.eu website.

The Main Organizer, co-organizers and partners form the Organizing Committee, to which they also invite people associated with the drone market and industry 4.0. The chairman of the Organizing Committee is Sławomir Kosieliński. The full composition of the Committee is published on the Droniada.eu website.

The **Judges' Committee** consists of:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Mariusz Sumara, Tomkov Group,<br/><b>Chairman of the Judges' Committee</b></li> <br/> <li>Grzegorz Bilski, DronLab sp. z o.o.<br/><b>flight directors</b><br/>("Relay" competitions)</li> <li>• Wojciech Gruzliński, AeroMind sp. z o.o.,<br/><b>flight director</b> (competitions, "Tree of Life", "Intruder", "Construction")</li> </ul> | <ul style="list-style-type: none"> <li>• Ryszard Królikowski,<br/>Mikromakro Institute Foundation<br/><b>Vice-Chairman</b></li> <li>• Karol Juszczyk, Foundation and the<br/>Mikromakro Institute; <b>technical judge</b></li> <li>• Maciej Zawistowski, expert of the Drone<br/>Center – Center for Unmanned Systems<br/>CNBOP-PIB, <b>secretary of the Judges'<br/>Commission</b></li> </ul> |
|---|--|

### Contact:

"Mikromakro Institute" Foundation, Al. Komisji Edukacji Narodowej 36/112b, 02-797 Warsaw, Sławomir Kosieliński, President of the Board, tel. +48514828727, [kosiel@mikromakro.pl](mailto:kosiel@mikromakro.pl) www: Droniada.eu. FB: @droniadacc.

## 1. Date and place

The "demo of the system" consists in preparing a 3-5 minute film presenting the participant / team and his idea to start in selected competitions. We are waiting for the films until June 20 . On Saturday, June 25, the teams come to Katowice. They report to the second part of the "Demo system" competition – a review of the equipment and checking the pilots' privileges. After that, the qualification for the "Relay" begins. The next day there are trainings in other competitions and the main competition "Relays".

On Monday, June 27 and Tuesday, June 28, we will conduct other field competitions and workshops. On Wednesday, June 29, the winners in individual competitions will take part in the Droniada GZM Final. Then there will be an award ceremony around 13-15 (the date depends on the course of the competition and meteorological conditions).

Participants apply as participants via the application form on the droniada.eu website (the leader fills in the application on behalf of team members, his data is at the beginning) with an indication of which competitions he intends to participate in, while everyone else (e.g. organizing committee, judges, speakers, listeners) as observers. The team can have a total of 8 people.

## 1.1 Venue

Field competitions, depending on the task, are played in the green area of the Muchowiec airport, without crossing the concrete runway. In the "Relay" competition in its main competition, drones fly outside the airport over the Katowice Forest Park.

Directly at the starting point you can stay with the team in accordance with the random order, the Judging Committee and the Organizing Committee with its own and guests. Another team is also ready to start, so that in case of unforeseen difficulties it will replace the current starter. Other persons are in a designated fan zone suitable for a given competition.

The announcement of the results of the competition and the award ceremony will take place on Wednesday, June 29, 2022 after the preparation of the protocol on the conduct of individual competitions.

## 1.2 Teams

In Droniada GZM can participate:

1. academic teams from student scientific circles and associated with universities, which may include students, doctoral students, university employees; it is allowed to start different teams from the same university;
2. intercollegiate troops;
3. and bottom-up nothings within the teams built task-oriented for the competition, as a haven for possible future startups, i.e. open teams not related to universities;
4. individuals.

The leader - like the captain of the national team at the Olympic Games - chooses the competitions in which he and his team will take part. A different squad or all of them together may be designated for individual competitions, bearing in mind that the entire representation consists of a maximum of eight people. Other people who do not take part in the competition support their colleagues from the audience.

Teams may use the support of trainers / mentors indicated by the Organizer or selected independently both in the field of organizational, hardware or programming assistance.

Cash prizes will go to the account of the university or non-governmental organization that patronizes the team or to the account of a business entity or individual in the case of open teams. On the other hand, honorary prizes are awarded to the participants themselves. The winners are obliged to pay the appropriate tax on the prizes.

Therefore, participants who meet the following conditions jointly may join the competition.:

- a) They will register by February 28 via the registration form on the Droniada.eu website. In justified cases, it is possible to register later after applying for consent to the Chairman of the Organizing Committee.
- b) They will pay a starting fee of PLN 1230 gross (23% VAT; PLN 1000 net) until 3 May 0, 2022 to the Organizer's bank account:  
Mikromakro Institute Foundation, Al. Komisji Edukacji Narodowej 36 lok. 112B, 02-797 Warsaw NIP 9512293688; Bank PEKAO SA VIII O/Warszawa Wołoska 18, account no. 36124011121111001027439367 title: Droniada entry fee. Team name, organization.
- c) By June 15, 2022, they will present to the Chairman of the Organizing Committee and the Technical Judge how they intend to perform selected competition tasks in writing or in another form chosen by them – it is about presenting preliminary concepts and assumptions for the implementation of tasks, so that the Organizer assesses the risk and chances of correct performance of the mission by the team. However, by June 20, participants are obliged to send a 3-5 minute film about themselves and the idea to start. This is the first part of the "Demo of the BSP system" competition. The organizers reserve the right to select some fragments of the films and edit their own material promoting the start of the competition.

- d) They will indicate by 20 June 2022 who will be the pilot of the drone within the meaning of Implementing Regulation (EU) 2019/947 of 24.05.2019 on regulations and procedures for the operation of unmanned aerial vehicles (hereinafter referred to as the Implementing Regulation). We require: providing the operator number in the register of operators; indication of the pilot's number in the register of pilots; make a statement that either the pilot has obtained a certificate of competence of an unmanned aircraft pilot in general category A2 or that a BSP pilot has passed the drone pilot exam in a special category for any National Standard NSTS Scenario.
- e) Before take-off, the pilot must take out a valid third party liability insurance for the user of aircraft with a maximum take-off weight (MTOM) of up to 25 kg in terms of damage to property and person. The Organizer also accept additional purchase of aircraft damage insurance (Aerocasco), because the Organizers are not responsible for equipment failures and its possible destruction during the competition and the consequences of this.
- f) Participants are required to provide the Technical Judge with the address [biuro@mikromakro.pl](mailto:biuro@mikromakro.pl) logs from their flight in text form within 30 minutes of the end of the competition to confirm that the flights took place in the designated zone and at the set ceilings.
- g) The drone operator before each launch is obliged to report the mission to the PansaUTM system using the Droneradar application.
- h) Dron is to meet the requirements indicated below :
- i. placing on the surface of the unmanned aircraft (bsp) a plate containing the name of the entity that is the operator of the bsp and contact details; in accordance with the regulations on the geographical zone, the operator is the Mikromakro Institute Foundation, the main organizer. The team will receive a plaque on site.
  - ii. in the case of an unmanned aircraft which is a multi-rotor, helicopter or aerostat with white flashing light placed on the upper surface of the fuselage in such a way as to ensure omnidirectional light emission;
  - iii. will be a drone equipped with devices or systems mounted on board it or being its ground equipment, enabling:
    - maintaining the assumed flight parameters,
    - ongoing monitoring of flight parameters, including determination of:
      - flight path, flight speed, altitude by barometric altimeter, degree of charge of the power batteries or degree of fuel consumption, quality and strength of the communication signal between the unmanned aircraft and the remote control station,
    - iv. location basic - determination of the current position, speed, altitude and direction of flight of the unmanned aircraft in order to transmit these data to the air traffic service provider by means of an electronic system or by telephone at the request of the ATS unit;
    - v. location emergency - determination by the operator of the current position of the unmanned aircraft in the event of irretrievable loss of ability to control the aircraft or the occurrence of interruptions in communication between the remote control station of the unmanned aircraft and this vehicle;
    - vi. automatic execution of the emergency procedure, including:
      - termination of the flight by emergency landing, or
      - continuing the flight along a route programmed prior to the flight, or
      - flight to a pre-flight pre-flight location,
    - vii. the drone will record flight parameters from the moment the unmanned aircraft control system is activated until the system is switched off;
- i) Teams must accept these terms and conditions to enter the competition.

## Important information

- In the competition, we score individual, partial solutions and do not depend on their correct completion of the mission, although in order to win cash prizes in selected competitions, you must get at least 60% of points.
- An absolute condition for participation in the "Relay" competition is to conduct a risk analysis in accordance with the SORA methodology, the results of which are submitted by the teams to the Judges' Committee by June 23.
- UAV up to 25 kg MTOM are programmed in accordance with the competition assumptions.
- Between March 5 and May 20, we will send training materials indicated by him to the address indicated by the participant of the "Tree of Life" competition, e.g. cardboard tubes.
- The landing pads will be ordinary helipads/banners measuring 2x2 meters without radio equipment, but also wheels with a diameter of 75 cm may be allowed.
- The area of the competition is to be the Muchowiec airport in Katowice, Metropolis GZM.
- The only way to conduct missions are automatic flights. If the conditions force the operators to take over the reins in the process, they report it immediately to the judges. This means the end of the mission. For airframes, manual take-off and landing are allowed.
- All missions are performed by the participants one at a time. The Organizer agrees to the use of more than 1 machine by the participants, provided that an appropriate horizontal and vertical separation approved by the echoic system is maintained.
- Repetition of missions is permitted under the conditions laid down in the specific rules of the competition concerned.

### 1.3 Equipment

The organizers focus on popularizing the safe use of drones in automatic flights. In this situation:

- The organizers allow drones with a curb weight of up to 25 kg to the competition. Ideally, the drone should be resistant to drizzle lasting up to 15 minutes and fleeting low-intensity rains. Also to be able to fly with gusts of wind up to 36 km / h. The organizers reserve the right to conduct tests imitating the above-mentioned weather conditions on the last day of the competition. However, it is assumed that flights take place with wind gusts up to 8 m / s, in rainless weather and with a solar activity index Kp below 4.
- Wysokość przelotu: MSA (Minimum Sector Altitude) 4 m AGL, NOT EXCEEDING ALTITUDE 120 m AGL.
- We establish that you can fly within the boundaries of the Muchowiec airport provided that you do not approach the edge of the runway at a distance closer than 50 meters, unless there is a state of higher necessity in the form of a dynamic Non Fly Zone.
- The drone must be equipped with devices that automatically maintain altitude and distance from the operator below the maximum permissible value, allow ongoing monitoring of flight parameters with a recording function, allow the basic location of the drone (position, speed, altitude, direction of flight) and emergency location in the event of loss of communication or control capability. The conditions are given in section 1.4.h.
- Operators may use FPV goggles to supervise the flight, provided that after take-off, they put the flight controller (apparatus) aside and will not use it until the end of participation in the competition, unless there is an unexpected situation requiring taking over the reins, of which the Judging Committee must be immediately notified..

## 2. Description of individual competitions

### 2.1 DEMO OF THE SYSTEM. SATURDAY, 2 JUNE 5

On Saturday, June 25 at 10.00 a.m., all teams check in in front of the Silesian Aero Club building at the Muchowiec airport. The Chairman of the Organizing Committee and the Chairman of the Judges' Committee present the principles of equipment testing as the second part of the "Demo UAV system" competition. The judges have 20 minutes to talk to the team about preparing for the competition.

In this phase it is about lot in each direction after 2 m, checking the RTH procedure and safely landingno. If a team encounters problems and has to stop its attempt, it is entitled to one replay after the other teams have completed the first attempt.

Then, the participants of the "Relay" competition proceed to the qualification for Sunday's main competition, which consist in flying the Muchowiec airport twice along a given route. This is a route of 5 km to the ceiling of 120 meters AGL. Participants who pass the qualification will receive permission to start in the main competition, including a flight outside the airport to the Katowice Forest Park, over which the route leads and will get 10 points in the "Relay".

The remaining participants are waiting for the end of the qualification. The organizer keeps records for trainings on the fields of other competitions. They start after the Relay and Demo System competition, maintaining vertical separation up to a ceiling of 60 meters AGL.

About this phase, the Judging Committee will assess the course of the Demo system and indicate who won.

Remark! It will no longer be possible to make significant changes at the airport. It is necessary to have a checklist prepared.

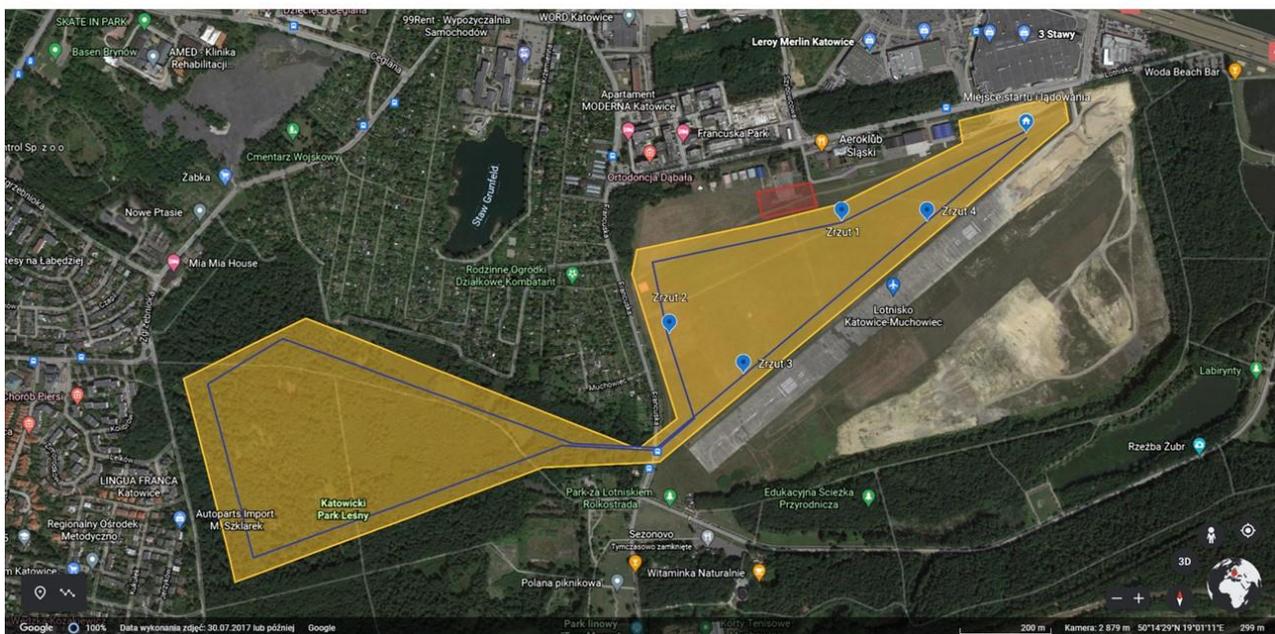
### 2.2 RELAY. SATURDAY - SUNDAY, JUNE 25 - 26

#### Information needs



Trasa pięciokilometrowej konkurencji „Sztafeta” w ramach konkursu technologicznego Droniada 2022

Najdalszy punkt leży 2 km od miejsca startu; cztery punkty zrzutu wyłącznie w obrębie lotniska Muchowiec.



The competition tests the skills of participants in conducting automatic, long-distance drone missions and in the software of the system for precise dropping of light bicons.

The competition shows the possibilities of drones supporting search and rescue operations and firefighting operations, in which it is important to determine the path of movement for rescue teams.

The assumptions of the competition were prepared by the team of the High Flyers Inter-Faculty Scientific Club from the Silesian University of Technology.

## Scenario

Fog significantly limits the visibility of rescuers who are looking for a missing person in wet meadows. The commander, in order to ensure the safety of his people before they enter the action, decided to set out paths of movement for them, dropping glowing bicons from the drones. Drone teams were given a map with a marked route on which rescuers are to move and drop sites every 500, 1000, 4000 and 4500 meters from the start. A tall tree was marked on it, which should be absolutely bypassed – this is the so-called Non Fly Zone, but operators were also warned that during the deployment of bicons there may be an immediate need to change the direction of flight – then the original section gains the status of a dynamic Non Fly Zone. However, it is the pilot who decides whether to change the route.

1. Prepare an unmanned flying system capable of automatic flight over a distance of 5000 m with overcoming Non Fly Zones – both static and dynamic;
2. Develop a system of precise discharge, which can include self-propelled light bicons;
3. Complete the mission by dropping bicons accurately every 500, 1000, 4000 and 4500 meters from the start. Remember that they must also light up after landing.

## Policy

Bicons are flashing high-power LEDs. They can be completely their own design, e.g. capable of controlled flight (this also applies to mini-drones) or be ordinary, bicycle lights. It is the participant who decides what to use. What counts is the goal - to light the way for rescuers.

- Bicons must be dropped at least from a height of 30 meters AGL.
- The drop points will be marked with a flag (2 m. pole with a flag) from and before the mission its geographical coordinates will be known. Under the poles lie square, white banners with a side of 1 m.
- Only one bicon can be dropped on a given drop site.
- Bikon after landing must shine for at least an hour.
- Bikon must not be life-threatening. It must weigh less than 250 grams.
- Bikon can have a drive and electronics supporting tracking. However, it must be autonomous.
- The first goal lies 500 m from the start, the second goal - 1000 m, the third - 4000 m, the fourth - 4500 m.
- The maximum number of points that can be obtained for hitting a target depends on the distance of the target from the starting point - the farthest target = the largest number of points.
- What counts is the accuracy of the drop – the number of points depends on the distance of the bikon after landing from the flag (0 to 1 m; 1.1 ~ 3 m - half of the points, 3.1 ~ 5 m - 1/4 points, over 5 m - 0 points).
- During the mission, you must bypass the forbidden zone (geofencing) and for additional points you can bypass the dynamic forbidden zone (more information in the mission plan).
- The entire mission (except landing and take-off) should be in autonomous mode.
- You must fly along the scheduled route in the designated air corridor. Shortening the route means awarding penalty points. Three times departure outside the designated corridor (not applicable to the National Health Fund) means immediate termination of the mission and an order to land in a safe place.
- The live video broadcast of the mission will be additionally scored. It must also be saved for later viewing (on the memory of the control station or UAV)
- The take-off site is different from the landing, although within the former runway in the north-east part of the airport, which allows you to perform two operations at the same time.
- Only unmanned aerial vehicles are allowed to compete.
- It is allowed to return the machine to the starting point during the competition (stopover).

- It is allowed to land in autonomous mode, on a parachute or manually. A manual landing does not receive an additional two points and on a parachute it will receive them, provided that the machine lands in a circle 5 meters from the starting point.
- A second flight after all participants is allowed if the participant considers that it will perform better. What counts then is a better result.
- The next team goes into battle when the predecessor passes Francuska Street and flies back into the airport space no later than before the drop point No. 3.
- On the test day, the Judging Committee checks the activities of the bicons, which must be clearly marked whose they are.
- If the machine starts in autonomous mode or but is manually thrown or uses a catapult, the start is treated as autonomous.
- Qualifications for the main competition are valid, which are to test the ability of machines to fly safely. On the eve of the main competition, participants take off on a route of 5 km inside the Muchowiec airport (double loop). No light bicons are dropped. Only those participants who pass this test will get permission to mission outside the airport and drop bicons in the main competition.



### Mission Plan

- Notify the Jury of the course of the mission. Whether there will be a stopover, whether there is a video transmission, the course of the mission, etc.
- Wykonać preflight check.
- Prepare for the launch and report the start of the mission, for which you receive 30 minutes.
- Start the machine.
- If the band has the opportunity to do so, present a live video broadcast to the Jury, if there is a suitable internet connection also broadcast it over the Internet.
- Soar to the ceiling chosen by the team, but not less than 30 m.
- Bypassing geofencing, make a drop in selected places.
- The jury introduces a dynamic geofencing zone during the course. The jury gives the coordinates and the diameter in meters of the circle to be bypassed. This information is given during the mission on a piece of paper and e-mail and on WhatsApp of the competition. Withespol modifiesthe flight plan live.

- Return to the starting point and land. The unmanned aerial vehicle can land in autonomous or manual mode. If the landing is manual, the pilot announces the performance of such a maneuver.
- Thenext teams will startthe mission when the predecessor returns to the airport, but no later than before its arrival at drop point 3.
- Bikons are supposed to flash 60 minutes + . The bikon should also be properly signed (characteristic color, sticker, etc.) to allow easy recognition of the Jury who dropped it. Bikons are collected after the end of all competition. At each drop point, a representative of the Organizer watches over, who provides information about the status of bicons on an ongoing basis.
- The jury must provide information on static geofencing and the place of discharge, one month before the start of the competition.

## Scoring

Relay	Assessment	Comment
For passing the qualification	10	<i>If the participants perform the flight safely and correctly during the qualification.</i>
For the flight of the full route	20	<i>If participants complete a mission after a scheduled route</i>
For the discharge of the bikon in the designated place within 5 meters	0 - 10	<i>0 points = no hit or outside the area of 5 m from the flag 1 point = goal 500 m away from the start 2 points = 1000 m 3 pts = 2000 m 4 pts = 4500 m</i>
For an accurate drop of the bikon as close as possible to the flag	0 – 20	<b>REMARK! Each drop point is scored separately!</b> <i>5 points = up to 1 meter from the flag 3 pts = 1.1 ~ 3 m 1.5 pts = 3.1 ~ 5 m 0 points = more than 5 m</i>
For each bikon that lights up an hour after dropping	0 – 8	<b>REMARK! Each bikon scores separately!</b> <i>2 points = lit for an hour (60 min+)</i>
For the correct maneuver of bypassing the static forbidden zone	2	<i>Bypass the static forbidden zone</i>
Bonus for the correct maneuver to bypass the dynamic forbidden zone	6	<i>Bypass the dynamic no-go zone</i>
Bikona construction	0 – 12	<i>12 points = a self-propelled bikon, capable of independent flight and autonomous landing in a designated place – it can even be a small drone, as long as it shines for 60 minutes after landing; 8 points = any LED lamp that survives the fall from min. 30 meters. 0 points = mechanism not working.</i>

Take-off and landing in automatic flight mode	0 - 2	<i>Point for take-off, second for landing. The drone must land in the designated place. Manual take-off and landing shall only be permitted in the case of airframes.</i>
Flight video bonus	5	<i>When the participants of the competition together with the Jury follow the course of the mission on an ongoing basis</i>
The shortest ongoing mission of any team	5	<i>Provided that the mission ended with an accurate drop of bicons under 60 minutes If not, then the points are not accrued and the mission is interrupted. Points are calculated on the basis of other criteria.</i>
In the second time	3	<i>Ibidem</i>
In the third time	2	<i>Ibidem</i>
In the fourth time	1	<i>Ibidem</i>
For no logs	-5	<i>According to the regulations, the team has up to 30 minutes to send logs to the Technical Judge after the mission. REMARK! Landing a drone does not end the mission! It is up to the team leader to tell the judges that he considers the mission to be completed and then they stop the time, as long as it lasts no more than 60 minutes..</i>
Three times beyond the envisaged corridor		<i>An order to immediately land in a safe place and complete the mission while retaining the points obtained.</i>
For shortening the route	-20	<i>If the participant has passed the eliminations, he undertakes to perform the flight on the entire route.</i>
Maximum number of points	<b>100</b>	<i>From this result taking into account bonuses, penalty points are deducted, of which there are 25 in total.</i>

Competition coordinator: Krzysztof Puzio

## 2.3 TREE OF LIFE. MONDAY, JUNE 27



### Information needs

The competition tests participants' skills in remote sensing using machine learning and automatic selection systems. It introduces precision agriculture, including the detection of pathogens of plant diseases and the precise dosage of plant protection products.

1. How many apple trees are healthy?
2. How many apple trees are on the verge of the disease?
3. How many apple trees are infected with powdery mildew and how many with scab?
4. How to build a system of precise dosing of plant protection products that can be used from the air in automatic flight?

It is an opportunity to combine skills in information analysis and AI with mechatronic skills. The drone is the carrier of the system.

### Scenario

Apple orchards require special care. Orchardists are afraid of two pathogens: apple scab and apple mildew. The task is to inspect orchards consisting of 100 apple trees growing irregularly over an area of several hectares. Apple trees grow in groups of 10 trees at intervals of 5 meters from each other, there are also those that grow independently away from other trees.

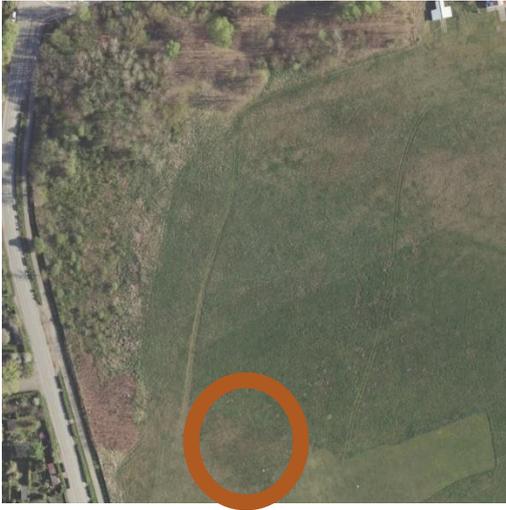
The owners are preparing for new plantings and orchards, but they are afraid that pathogens will attack new trees. Drones are supposed to detect:

1. apple trees susceptible to diseases
2. apple trees already infected with powdery mildew and scab
3. determine how many trees are healthy
4. immediately proceed to precise spraying – elimination of the threat.

Apple trees prone to diseases are symbolized by brown circles (RGB 147, 107, 76) inscribed in a white square from a banner with a diameter of 1 meter with two-meter composite poles driven in the middle. It is not known how many such trees there are.

Ten apple trees attacked pathogens: apple scab and powdery mildew in a proportion unknown to the participants. Infected with scab are golden (RGB 212, 159, 65), and infected with powdery mildew - beige circles (RGB 249, 246, 227). The others are healthy trees, i.e. under the poles are spread square, white banners with a side of 1 m. Poles can replace cardboard tubes with a height of 200 cm and a diameter of 12 cm.

Drones are coming to the competition field prepared in this way, or a robot (Mars rover) is also coming. Flying (and riding) robots are looking for trees on the verge of disease (brown



circles) and infected trees (wheels in gold and beige colors). Here, teams can adopt two strategies: the drone-scout proceeds immediately to spray or calls for help from a specialized robot. However, the algorithm must be constructed in such a way that scab is eliminated with agent A, and powdery mildew with agent B.

We recommend preparing a "detect - eliminate" algorithm mounted on one machine, but the second solution is equally legitimate, in which it will be necessary (and at the same time very interesting) to exchange information between robots and coordinate their work.

Plant protection products symbolize gelatin paintball balls with a diameter of 0.68 inches, weight 3.2 g, in yellow and orange colors, filled with biodegradable paints of any manufacturer.

On board the drone or robot you need to take 10 balls of both colors. Drones/robots are to dose them from approx. 4-6 meters using a gravitational or pneumatic mechanism. Scab has been identified, yellow balls are flying. Powdery mildew is detected, then orange fall.

The team reports online progress in tree detection and ball dropping. Remark! The use of gravity discharge guarantees the breaking of balls in approx. 6/10 of cases, while the use of a pneumatic mechanism gives an effect of almost 100%. In memory – breaking the balls is not necessary and is not the subject of scoring, but undoubtedly it definitely facilitates and speeds up the counting of points and the effectiveness of the mission. The judges are tasked with determining whether the right ball has hit the area occupied by the pathogen.

Teams remotely report the mission in real time, sending regular information about the position, speed and condition of the drone. Key events, detection of trees at the threshold of the disease, location and identification of the pathogen, launch of control along with the determination of the selected agent are also subject to reporting. The result of the mapping, i.e. a map of the orchard with the marking of circles occupied by pathogens and at the threshold of the disease, should also be transmitted remotely and immediately, during the mission.

### **The course of the competition "Tree of Life"**

Drones from the launch permit have 20 minutes to carry out the mission in orchards located on the area of 2 hectares. It is necessary to identify apple trees susceptible to diseases and to detect outbreaks of plant diseases: scab and powdery mildew of apple trees, then apply plant protection products.

On the competition field of about 2 hectares we put 100 composite poles with a height of 2 meters and fi 12 mm. Under them we lay out 10 circles in gold and beige colors and a publicly unknown number of brown circles inscribed in square, white banners with a side of 1 m. The remaining poles are marked with square, white banners with a side of 1 m. These are healthy trees. They can be symbolized by cardboard tubes with a height of 200 cm and a diameter of 12 cm.

The golden circles symbolize the apple scab, while the beige ones are apple powdery mildew. We will print these wheels on 3 mm foamed PVC. On the other hand, apple trees prone to diseases represent brown circles inscribed in a square from a white banner.

The ball must fall within the circle. We complete the task if it hits it, but it will jump unexpectedly beyond 50 cm. In general, it should break – then the paint will spill. The Judging Committee is obliged to check where the ball fell. If a ball of the wrong color falls on an infected sapling or susceptible to diseases, then there are no points for this. If it falls on

healthy, penalty points are calculated. The team reports on progress on an ongoing basis online.

The key technology is an algorithm that interprets the image (healthy sapling, tree susceptible to diseases, sapling infected with scab or apple powdery mildew), combined with a mechanism that triggers the right plant protection product in the right dose and correctly applied = one, appropriate ball falling on the infected tree, or an algorithm correlated with the management system of a team of flying and / or land robots.

Plant protection products symbolize gelatin paintball balls with a diameter of 0.68 inches, weighing 3.2 g, in yellow and orange colors, filled with biodegradable paints. You must take 10 balls of both colors on board. The judges check that the participants have inserted the correct balls.

## Scoring

Tree of life	assessment	comment
For the preparation of a map of orchards with trees marked on it, divided into those susceptible to diseases and infected with pathogens (with their distinction) and a message about the state of orchards	0 - 5	5 points = ready digital map available online as part of the mission report with all trees marked divided into susceptible to diseases, infected with scab, infected with powdery mildew, healthy. A clear message of how many trees there are of each type. 3 points – as soon as the trees with brown, beige and gold wheels were marked and a message was given, how many there are. 1 point = map of only 10 trees occupied by pathogens with a message about the division of diseases. 0 points = no map. This is generally a 2D image - a projection from the top of the competition area.
For the accurate discharge of the right ball (plant protection product) on the infected apple tree	0 - 10	1 point for the accurate application of the right ball within a golden (scab) or beige circle (powdery mildew). A point can be obtained when the color of the ball symbolizing the plant protection product fighting the pathogen agrees with the detected infection. Yellow ball = scab; orange ball = powdery mildew.
For a clear photograph of each outbreak of the disease (10 trees) and sending it immediately to the command post in the form of a communicative and transparent mission report available online	0 - 5	Each detected pathogen = 0.5 points. The photos are to be available immediately to the judges in the form of a report, e.g. on a website. It can be combined with a digital map.
Bonus for the chosen strategy of pathogen detection and elimination	1 - 10	10 points = effectively carried out "detect – react" action both in the case of using one drone, as well as a team of two or more drones or a driving robot, as long as six or more appropriate balls were applied to the "sick apple trees". 5 points = if the algorithm worked properly, but five to nine balls would fall outside

		the apple tree. 1 point = if the algorithm worked correctly, but if only one or no ball hit the area occupied by the sick apple tree.
For a comprehensive online mission report	0 -5	5 points – when there is an online map with a full division of trees, specifying what ball was used, where and at what time, the drone's flight route and the time of completing the task are graphically presented 3 points – as soon as there is information about what ball was used, where and at what time, the route of the drone and the time of completing the task are graphically presented. 1 point – as soon as the times and places of use of the balls are presented 0 – when there is no online report
Dump mechanism	0 – 5	5 points: a working mechanism that gives the ball energy. 3 points = working gravitational mechanism. 0 points = non-working mechanism.
Take-off and landing in automatic flight mode	0 - 2	Point for take-off, second for landing. The drone must land entirely on the area of the landing strip from which it started the flight in automatic mode
Automatic flight bonus	3	The bonus is added to the final score as long as the team completes the mission from start to finish in automatic mode.
The shortest ongoing mission of any team	5	Provided that the mission ended with finding the right trees and dropping balls under 20 minutes. If not, the points are not accrued and the mission is interrupted. Points are calculated on the basis of other criteria.
For the second time	3	Ibidem
In the third time	2	Ibidem
In the fourth time	1	Ibidem
For "spraying" a healthy sapling or a poorly selected agent against the pathogen	- 0,5	Penalty points deducted from the results of the competition for dropping a ball on a healthy tree (without a wheel). You can lose a maximum of 10 points because there are 20 balls on board.
Bypassing the launch site / completing the mission before the launch site	-2	Subtracted from the result of the competition. The idea is to end the missions on the airstrip.
For no logs	-5	According to the regulations, the team has up to 30 minutes to send logs to the Technical Judge after the mission. REMARK! Landing a drone does not end the mission! It is the team leader who must tell the judges that he considers the mission to be completed and then they stop the time, as long as it lasts no more than 20 minutes.
Maximum number of points	<b>50</b>	From this result taking into account bonuses, penalty points are deducted, of which there are 17 in total.

Competition coordinator: Agnieszka Kaleta

## 2.4 INTRUDER. MONDAY, JUNE 27

### Scenario

The crew of the transport aircraft reported a failure. On board were weapons that were to be delivered to the country possessed by war as part of a special operation of one of the allied services. It was impossible to wait any longer. The plane was directed to the airport located on the sidelines. At the same time, a group of officers was sent to protect the cargo so that there would be no deconspiracy. They had half an hour to check the area and evacuate outsiders.

Meanwhile, airport CCTV cameras detected a suspicious person dressed in a navy blue baseball cap (Navy Blue), a red polo shirt and blue pants who entered the airport with a black bag. She probably hid in an air hangar, where there were already a dozen or so people obliged to leave it. Or did she stay hidden near the hangar?

The commander of the action decided to use the drone to find the intruder. In order not to cause panic, he directed an ordinary watchman to the hangar (whose cell sent geographical coordinates to the command post as is the case, for example, in the Google Maps application or Garmin Explore – the "LiveTrack" function). However, he was given instructions not to try to stop the Intruder himself, but to evacuate all people to the evacuation meeting point at the airport.

The aim of the action is:

- automatic flight over a given area and reporting on events;
- automatic recognition of an intruder in a group of people leaving the hangar;
- tracking the Intruder up to the boundaries of the airport area

### Competition area



The competition area (zone) is an area of approx. 0.5 ha surrounded by an air hangar with a light turquoise roof with two windows at the airport next to a hangar with a white and red checkerboard and a hangar with a brown roof. Due to the ongoing work there, the exact boundaries of the area will be confirmed at the latest 1 month before the start of the struggle. It should be assumed that there will be more than one building in the competition area.

### Time and conditions of competition

1. The task lasts until all mission objectives are completed, no longer than 15 minutes. A gap is assumed between the two groups coming out of the hangar.
2. In the hangar waiting for the evacuation of 15 people + watchman. Person No. 17 must be an intruder.
3. It may happen that the evacuees will have a similar outfit as the Intruder, however, only the Intruder will have a laptop bag.
4. The action takes place in the afternoon between 16 and 20.00.
5. The teams are implementing the following scenario of the situation at the airport:
  - Two groups (e.g. 7 and 10 people each) leave the hangar and go to the evacuation collection point.
  - An intruder escapes from one of these groups and tries to get out of the zone.
6. The winner is the one who detects the intruder the fastest after leaving the hangar and will track him up to the limits of the designated zone.

## Technical requirements and safety rules

The ICT system is to transmit a live image detailing/markings a suspicious person to the website available to the jurors and document the progress in the form of his photo and current location. The drone should follow the person selected for tracking. The drone cannot fly over people (it can observe them from a distance).

1. There will be no machines or vehicles on the site.
2. The total weight of the drone must not exceed 25 kg.
3. The minimum flight height is 15 meters AGL (above the roof of the hangar). Maximum 120 meters AGL.
4. The operator must be able to take control of the drone at any time.
5. The drone must be equipped with a mechanism enabling automatic return to the vicinity of the starting point in the event of loss of communication with the operator.
6. The starting point is located in the competition area.
7. The drone cannot fly over the No Fly Zone

## The course of the competition

Time (minutes)	Task
-10.00	Preparation, checking the starting list, consent of the judges to start the competition.
0.00	Start of the drone – start of the competition and start of the patrol with a live transmission to the website
0.01	At the same time, a watchman goes to the hangar, who broadcasts his activity via LiveTrack.
02.00	March of the first group of people to the meeting point.
02.01	Drone looks for an intruder.
	Once an intruder is detected, the drone should keep tracking him all the way to the boundaries of the competition zone.
15.00	End of mission – the drone landed at the launch site

The task ends when the Intruder leaves the competition zone.

- At the end of the task, the aircraft should automatically land at the take-off point. The team leader announces the end of the mission and sends a report to the judging committee.
- At the end of the task, the aircraft should automatically land at the take-off point. The team leader announces the end of the mission.

## Punktacja

Stage	Points	Comment
Automatic take-off, flight and landing	0 – 5	If the pilot takes control of the flight, 2 points are due.
Correct detection of an intruder using artificial intelligence	0 – 5	Behind the documented photo detection of an intruder. 5 – for detecting an Intruder in the group. 2 – for detecting an intruder separated from the group, while escaping.

Online broadcast	5	Live transmission of the image from the drone to the website available to the jury.
Correct tracking of the intruder, giving his GPS location every 30 s.	5	Accuracy up to 5 m + timestamp – indication of the point where the intruder is 5 – for indicating the place of the intruder with visualization on the map during the live broadcast 2 – for indicating the position of the intruder in the report after the mission.
Drone tracking of an Intruder while escaping	5	5 - Following the drone in the footsteps of an intruder (adaptation of the drone route) 2 – The drone hangs stationary, and tracking takes place behind the camera and gimbal.
Fastest to find an intruder after leaving the hangar	0 - 10	The fastest team gets 10 points. Second: 7 points, third: 5 points. Others: 1 point each. Mission accomplished without achieved results; 0 points
Flying over people	-5	The first time negative points, the second time the command to immediately interrupt the mission.
Detection of a person outside the zone	-2	If the system began to identify people outside the zone.
Intruder misdiagnosis	-2	Identifying another person as an intruder.
An intruder escapes from the zone without detection	-5	Intruder escapes manhunt.
Causing a threat (assessed by the judging panel)	-2	<i>Authors:</i> <i>Marcin Gałczyński, Wojciech Gruzliński,</i> <i>Sławomir Kosieliński, Maciej Zawistowski</i>
RAZEM	35	

Competition coordinator: Jan Stojowski

## 2.5 CONSTRUCTION. TUESDAY, JUNE 28

### Information needs

The competition tests the participants' skills in the field of photogrammetry and remote sensing using machine learning in simulated conditions of the warehouse construction site. Creates a decision support system that makes it possible to meet the following information needs of construction companies:

- 1) Does the assembly follow the design created in the BIM environment?
- 2) What is the accuracy of assembly of prefabricated elements?
- 3) What is the effectiveness of employees – do they really do their job in accordance with the declarations of the foremen?
- 4) Do employees comply with health and safety regulations?

However, from the perspective of the drone ecosystem, the competition is an opportunity to present in practice the measurement and remote sensing capabilities of flying robots using RTK GPS (Real Time Kinematic) technology and machine learning..

### Scenario

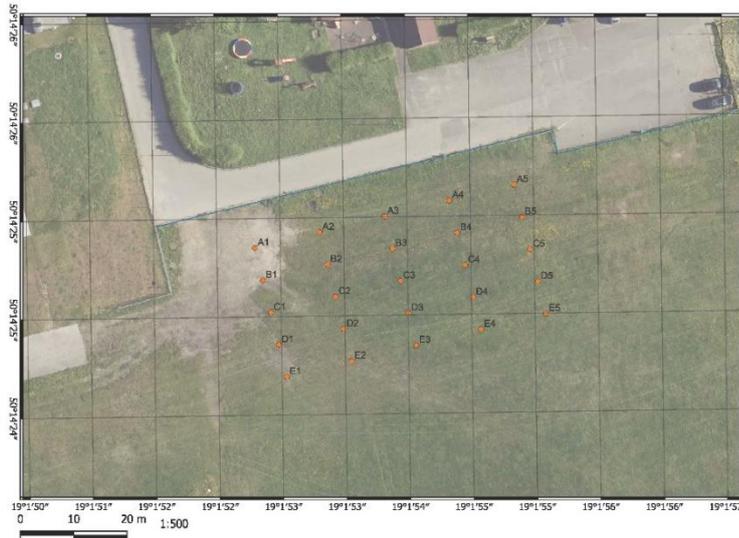
The construction of a warehouse with dimensions of 50 x 25 meters is underway. According to the design office, 25 prefabricated reinforced concrete columns with a height of 300 cm and a cross section of 20 cm have already been erected.

After the construction, four workers in yellow helmets and their foreman in a red helmet are busy. Unannounced, a surveillance inspector in a blue helmet appears. After a while, it becomes doubtful whether the poles are in those places where they should be in accordance with the digital design (BIM environment), whether they are properly placed at an angle of 90 degrees (i.e. whether they hold the vertical), then whether they have a declared height of 300 cm, in a word, whether the construction is proceeding correctly, as the foreman declares in his reports and in his wake – the design office. His watchful eye also caught that there are probably people here who work without helmets. Five non-compliances with the project and non-compliance with health and safety regulations are enough to stop construction and impose a solid penalty on the contractor. He uses drones to confirm his observations.

### Zadania

- Automatic flight over a given area and reporting detected objects;
- Detection of poles to which there are doubts whether they were erected according to the project. REMARK! It may happen that all 25 poles were erected incorrectly, and maybe it even turns out that there are one more or less than the foreman declared. The supervision inspector only needs 5 errors in the art of construction, including the lack of a pole or excess - to issue an order to stop work. The ideal is to achieve a measurement accuracy of 5 cm and confirm the vertical or show a deviation from the vertical with an accuracy of 5 degrees.
- Finding all the red, yellow and blue helmets on the construction site and indicating where they are. If the helmets hang on two-meter composite poles, it means that the workers wear them on their heads, and if they are anywhere else – the brigade does not comply with health and safety regulations.
- Generate an online report on the basis of which the supervisor will issue his decision.

### Competition area



The "hall" will take the form of a regular rectangle of 50 x 25 meters, in which there will be 25 poles, i.e. pipe mineral outdoor PVC sewer pipes with a height of 300 cm and a diameter of 20 cm in a rusty color. Their cups (fittings) with a height of 10 cm will be dug into the ground.

Note: the design of the hall, which will receive participants in the format \*.kml reflects the state according to the knowledge of the design office based on the statements of the foreman. The

actual state of affairs must be examined. This means that the judges evaluate the results on the basis of three plans: the office of the project that is it, the actual one prepared by the organizers and finally created during the mission. Participants receive the project 60 minutes before the start.

### Time and conditions of competition

- 1) The mission is divided into three phases:
  - a. photogrammetric flight, which must not last more than 30 minutes;
  - b. preliminary data analysis lasting 15 minutes, in which the participant decides whether to perform a second raid, but as a consequence he has less time for the final analysis of the data, i.e. if the flight lasts 30 minutes, he is reduced in time for analysis.
  - c. data analysis, which generally takes up to 180 minutes, unless the circumstances referred to in point 7b arise.
- 2) Participants can use RTK ground stations.
- 3) The design office forwards the project file (i.e. the state on the construction site according to their knowledge) 60 minutes before the start of each participant by e-mail to the address set in advance and provides a link to download from OneDrive. In parallel, they get a printout. During the preparation period, participants receive test project files. They also have the right to make their own measurements on the construction site on the eve of the competition..
- 4) The action takes place during the day.
- 5) Participants are to confirm the following observations of the supervision inspector in the form of a report:
  - a) Is the construction proceeding according to the project?
    - i. Make a flight and visualize the general differences between the design and the real state
    - ii. How many poles are there actually?
    - iii. Do they stand where the design office thinks – you need to measure at least one pole with the greatest possible accuracy – the ideal is to achieve a measurement with an accuracy of 5 cm – and relate the measurement to the design: what is the difference? The inspector only needs one piece of evidence, but he will be happy if there are more measurements.
    - iv. Whether the poles stand straight – the inspector claims that one or several are /are deviated from the vertical by 5 degrees or more. One proof is enough for him, but he will be happy if there are more measurements.

- v. Whether they have a declared height – the inspector has doubts. One proof is enough for him, but he will be happy if there are more measurements.
  - b) How many people have protective helmets on their heads, and if they don't, where do they lie? Enter the geographical coordinates of all helmets, collect evidence in the form of a photo and indicate those that are not on the head (pole).
- 6) The winner is the one who scores the most points.

### Wymogi techniczne i zasady zachowania bezpieczeństwa

More than one drone can be used in the competition. The drone can be RTK class, but if someone takes off without RTK on board and performs all measurements correctly, he will receive additional points. In this case, we allow the possibility of using traditional measurement methods and combining them with measurement from a drone. We agree to allow selected people to enter the field and set up geodetic equipment during the mission before the drone enters the construction area.

- A drone cannot fly over people.
- Ground and drone RTK system and traditional measuring equipment are allowed
- There will be no machines or vehicles on the site.
- The total weight of the drone must not exceed 25 kg.
- The minimum flight altitude is 15 meters AGL. Maximum 120 meters AGL.
- The operator must be able to take control of the drone at any time.
- The drone must be equipped with a mechanism enabling automatic return to the vicinity of the starting point in the event of loss of communication with the operator.
- The starting point is located 25 meters south of the E3 pole.

### The course of the competition

Time (minutes)	Task
-60.00	The team receives the project (e-mail) from the design office in kml format.
-10.00	Preparation, checking the starting list, consent of the judges to start the competition
0.00	Launch of drones in photogrammetric and remote sensing missions
30.00	Maximum time to collect data using a drone. After the drone lands, there may be a phase of creating and sending a report.
180.00	End of mission.

1. Mission ends
  - a) When the time is exceeded
  - b) After achieving all the goals – a clear message from the team leader
  - c) Following the decision of the judging committee or the flight manager

1. At the end of the task, the aircraft should automatically land at the take-off point.

### Scoring

	Stage	Points	Comment
1)	Automatic take-off, flight and landing	0 – 3	If the pilot takes control of the flight, only 1 point is due. Does not apply to the performance of maneuvers aimed at protecting people and property

2)	Visualize the differences between design and actual state	0 - 2	It is about a graphical comparison of the project with the actual state. If the visualization is available online immediately = 2 points; if it is available before the end of the mission in the form of graphics = 1 point; No documentation = 0 points
3)	Determination of the actual number of poles	0 - 2	Specify in the online report, which includes a visualization of how many poles there are with the geographical coordinates of their centers or a photo of the place where the pole should be or stands redundant = 2 points. Photo only = 1 point. No data = 0 points
4)	Measurements of the position of columns with an accuracy of 5 cm	0 - 5	If the position of one pole was measured with an accuracy of 5 cm and the online report shows the difference between the measurement and the design = 5 points; if the pole was measured with an accuracy of > 6 cm to < 10 cm and the difference between the measurement and the design = 4 points is given; if the pole was measured with an accuracy of > 11 cm to < 15 cm and the difference between measurement and design = 3 points; No measurement with expected accuracy = 0 points. If the team measures other poles, it will receive a bonus. A prerequisite is to maintain an accuracy of 5 cm.
5)	Vertical measurements	0 - 5	The team selects one of the poles and is to confirm or deny that it is standing straight with the angle (90 degrees or 95 degrees or maybe 85 degrees) = 5. If the accuracy of the measurement is in the range of > 5 degrees, < 10, then only 3 points are due. No measurement = 0 points If the team measures other poles, they will receive an extra bonus [see below]
6)	Correct identification of pole height	0 - 5	The team selects one of the poles and is to confirm or deny that it has the declared height = 5 points. If the accuracy of the measurement is less than the assumed 5 cm and is in the range of > 6 cm < 9 cm, then only 3 points are due. No measurement = 0 points If the team measures other poles, it will receive an extra bonus. [see below].
7)	Number of helmets	0 - 3	For each helmet found and documented with a photo from six = 0.5 points. No correct GPS indications above 3 meters = 0 points/. The bonus for helmets is not on the head - see the bonus.

8)	Online Report	0 - 5	It includes: visualization, providing the position and information about helmets, a proposal for a decision: close the construction site or not (if the deficiencies are < 5, then the construction works; if 5 or more = stops working. The report contains only half of the required information = 2.5 points. No online report = 0 points
9)	Premia za pomiar położenia	5	If more than 5 poles are measured. A prerequisite is to maintain an accuracy of 5 cm.
10)	Vertical measurement bonus	5	If more than 5 poles are measured. The condition is to maintain an accuracy of 5 degrees.
11)	Height measurement bonus	5	If more than 5 poles are measured. A prerequisite is to maintain an accuracy of 2 cm.
12)	Bonus for detecting violations of health and safety regulations	5	For correctly indicating and documenting with a photo helmets that are not on the head (two-meter pole).
13)	Bonus for the lack of RTK drone	10	When a drone without RTK is directed to the mission and still achieves the assumed accuracy, i.e. when measuring the position between 5 and 10 cm, and when measuring the vertical up to 10 degrees, when measuring the height up to 5 cm.
14)	Fastest mission accomplished	0 - 5	The fastest team, having completed the mission in full, gets 5 points. Second: 4 points, third: 3 points. Others: 1 point each. Mission accomplished quickly, but without achieved results; 0 points
15)	Flying over people	- 5	The first time negative points, the second time the command to immediately abort the mission.
	TOTAL	Od 55 do 65	I.e. the team with the RTK drone receives a maximum of 55 points, while without the RTK drone 65, if it achieves the assumed accuracy.

Author: Sławomir Kosieliński. Competition Coordinator: Michał Gaik

## **2.6 THE FINALE OF DRONIADA. WEDNESDAY, JUNE 29**

We invite the winning participants of individual competitions to join the drone company shows as part of a special open day for participants of the World Urban Forum in Katowice entitled "The Third Dimension of Cities". The shows will be followed by the announcement of the results and the award ceremony.

### **Awards**

All participants who take part in Droniada receive commemorative diplomas electronically.

Cash prizes will be transferred to the account of the university, non-governmental organization, business entity or private person participating in the oncurrent indicated by the team. Winners are required to pay the applicable tax on the cash prize. The division of prizes will be presented on the Droniada.eu until June 10.

### **Protection of personal data**

- 1) Personal data of participants will be processed for the purposes of organizing and promoting the Organizers' events, selecting the winners of Droniada and awarding and issuing prizes.
- 2) Personal data of participants will be processed in accordance with applicable regulations, in particular the Act of 10 May 2018 on the protection of personal data.
- 3) The processing and use of data also includes the publication of: name, surname, place name and name of the organization.
- 4) The Participant acknowledges that he has the right to inspect the content of his data and correct them.
- 5) Providing personal data and consent to their processing is voluntary, but necessary to participate in Droniada.

### **Final provisions**

1. During the competition, Participants (in the narrower sense – competitors, i.e. directly participating in the competition) should follow the instructions issued by persons responsible for security, security services and other persons appointed by the Organizers.
2. Each member of the team is obliged to sign a statement of knowledge of the regulations. By signing the above-mentioned statement, the athlete agrees to provide first aid, perform other medical procedures and transport the injured person to a safe place by medical and paramedical personnel acting on behalf of the Organizers.
3. The Athlete declares that he is able to participate in Droniada, he is not aware of any health reasons excluding him from participation and that he starts on his own responsibility, acknowledges that participation in the competition is associated with physical effort and possibly loss of equipment. In addition, participation in the competition may be associated with other, at the moment impossible to predict, risk factors. Signing a statement of knowledge of the regulations means that the athlete has considered and assessed the scope and nature of the risks associated with participation, he starts voluntarily and only on his own responsibility.
4. At the end of the competition, a random inspection of the equipment will be carried out, to which the athlete designated by the Commission must absolutely submit.
5. The Participant accepts these regulations and agrees to the free use of his image recorded in the form of a photograph or video recording and grants the Organizer a free license to use it in all fields of exploitation, including: recording and dissemination in any form and entering into computer memory, use for promotion and organization of events of the Mikromakro Institute Foundation, making them available to sponsors and partners for the purpose of their promotion in the context of participation in the event,

posting and publishing in the Organizers' publications, on the Organizer's promotional printed materials, in the press, on websites and in television and radio broadcasts.

6. The organizer guarantees the protection of copyrights of solutions of individual teams.
7. The organizer reserves the right to cancel the competition or interrupt it without giving reasons.
8. The binding and final interpretation of these Regulations is vested exclusively in the Organizers. In matters not included in the Regulations, the Organizers shall decide. If any provision of the Terms and Conditions is partially or fully held to be invalid or unenforceable, all other provisions (in whole or in part) shall remain in full force and effect.