

# DRONE



# STEAM

## DRONES@STEAM

Fostering digital Transformation in VET schools  
and creating new job prospects in the labour market

**Project Result No: 2**

**Activity 4: DRONES@STEAM JOB-SPECIFIC SCENARIOS  
FOR CODING A DRONE**

Scenario 3: Crisis Situation Management

Lead partner(s): RDPSEA, PIT



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## CONTEXT

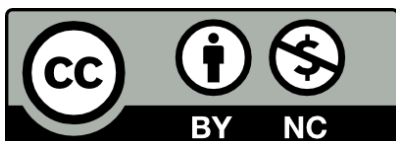
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<https://dronesteam.eu/>

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- Cyprus Computer Society (CCS) - Cyprus
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# Cross-Curricular Scenario 3: Crisis Situation Management

## 1 Introduction

The need for a crisis management plan (C.M.P.) in an area where many people are located is required by law and is also a necessity for everybody's safety necessary for the safety of all. The drafting of a crisis management plan is required to consider the particular operating conditions of the building and is a project that requires civil or safety engineer skills.

Some of the key elements of the crisis management plan are the recording and mapping of escaping routes, corridors routes, assembly points, inspection of facilities after their evacuation as well as the training of all those involved in its implementation. The use of DRONES is going to contribute to these processes.

## 2 Recording the problem (the need)

School units are places where we have a large number of students and teachers gathered for long periods of time. Crisis management, which can be associated either to natural phenomena e.g., earthquake or to anthropogenic factors e.g., fire, is usually described by a master plan, which in many cases has not been differentiated for a long time. A crucial factor for the successful implementation of a crisis management plan is its updating and training of all individuals who are involved in its implementation.

Studying action plans from various schools, we see that in many cases, while there is provision for the evacuation of buildings, the proposed routes, after the onset of a crisis situation, might not be so safe. For example, if there are routes that pass under large windows, during the event of an earthquake they could fall on those who follow them.

After the evacuation of the buildings, there is needed to check the premises for people who might either be trapped or need of help. In this case, the control is undertaken by members of the school staff at the crisis of their own safety.

For the successful implementation of an evacuation plan, test exercises are usually carried out where the followed procedures are not usually evaluated.

### 2.1 Keywords

Crisis management plan, emergency, crisis, disaster, safety, design, 3D imaging, Drone

## 3 Objectives and expected learning outcomes.

- Recognition of the need to have and update a crisis management plan.
- Control and selection of parameters influencing the choice of escaping routes.
- Safe operation of the Drone for the mapping of the premises
- Synthesis of data from the architectural drawings and representations of the Drone
- Decision-making for redesigning the action plan (C.M.P.).
- Solving a real problem.

## 4 Prerequisites

Students should:

- be familiar with the construction and basic programming structures of the Drone,
- have the ability to handle the Drone safely.
- understand the information given through the floor plans of a building and the architectural diagrams.

## 5 Transversal interdisciplinary interactions

The scenario promotes interdisciplinary approaches.

- Students and teachers of the construction sectors will contribute to the understanding of the structural elements of the buildings.
- The students of the IT sectors will strengthen the team in the drone programming processes.
- The mechanical and electrical engineering sectors will support the team in the construction of the Drone.

## 6 Implementation Steps

Step 1: Description of the problem / Reflection

Step 2: Nomination of ideas of proposals / Research Questions

Step 3: Organization and implementation of activities

Step 4: Recording results creation of a crisis management plan

Step 5: Presentation of a crisis management plan and testing of its implementation

### 6.1 Time allocation

The total duration of the scenario is nine teaching hours with the possibility of limiting or extending it.

The proposed breakdown of time by activity:

- Step 1: Description of the problem / Reflection (1/2 hour)
- 2nd Step: Ideas for proposals emerge / Research Questions (1/2 hour)
- Step 3: Organization and implementation of activities (3 hours)
- Step 4: Recording results creation of a crisis management plan (3 hours)
- Step 5: Presentation of a crisis management plan and testing of its implementation. (2 hour)

## 6.2 Step 1: Description of the problem / Reflection (1/2 hour) (Discussion with all team members)

- Students' concern about the need for a crisis management plan (C.M.P.) in the school unit.
- Study of the existing C.M.P. (if any)
- Discussion of students' experiences in the implementation of building evacuation exercises for cases of either natural disasters or other emergencies (e.g. earthquake, fire...)

## 6.3 Step 2: Nomination of ideas of proposals / Research Questions (1/2 hour) (Work in groups / plenary session)

- Discussion on the procedures to be followed for the drafting of the C.M.P.
- Identification of the information elements, indications, parameters that should be present in a C.M.P.
- Formulating ideas for the use of Drones in identifying problems in the existing C.M.P. and redesigning it.

## 6.4 Step 3: Organization and implementation of activities (3 hours) (Work in groups in the classroom, in the laboratory and in the school premises)

- Recording and mapping, also using the Drone, of the internal and external escape routes of the school unit.
- Implementation of a trial evacuation exercise of the school in cooperation with the School Management and mapping of the flow and gathering points of students and staff using the Drone.
- Identification of points that pose crisis or show increased flow during the evacuation of the building.
- Selection of optimal routes and concentration points during an exercise.
- Use of ArUco markers for programming the Drone so that it can move autonomously in space,
- Installation of ArUco markers for automated movement of the Drone in a confined space

## 6.5 Step 4: Recording results creation of a crisis management plan (3 hours) (Work in groups in the classroom, in the laboratory and in the school premises)

- Based on the recordings that have been made, new evacuation routes and selection of assembly points are discussed and designed.
- With the use of the Drone, the routes are checked.
- The existing C.M.P. is revised or a new one is created.
- They create guidance signs for students and staff during the school evacuation process and are placed at the points deemed necessary.

## 6.6 Step 5: Presentation of a crisis management plan and testing of its implementation. (2 hour) (Application/ Presentation/ Test)

- The new C.M.P. it is presented to the school management and with its agreement it is implemented and updated.
- Students and staff are informed about the new C.M.P.
- Students have the opportunity to create maps of the building, using the information collected from drones. These maps can indicate the escape routes, mark the exits of the building, and designate assembly points. They can also be posted in each classroom, published on the school website, and sent to the email addresses of all members of the school community.
- An evacuation exercise of the building is carried out, with the implementation of the new C.M.P., for control and understanding of the procedures by all.
- On the school's website, there is a post about the school's initiative, the program and the new C.M.P.

## 7 Reflection, feedback and scenario evaluation

Assessment is the "bridge" between teaching and learning, and because the positive effect of formative assessment or assessment for learning is important in improving learning outcomes, in addition to the constant interaction we have with children in the classroom, we could ask the children themselves to reflect on what they learned, what they liked as well as the way they worked with their classmates.

The formative assessment is done during the application with different methods and is directly linked to the proposed activities. Students are instructed to think about their own learning as well.

Questions that can facilitate this process are:

- What did I learn?
- What did I remember?
- What did I like?
- What didn't I like?
- What questions will I still have and what will I explore more?
- Did I work constructively with my classmates?
- Did I help my classmate when he needed me?
- Did I hear my classmate's opinion?

**Indicative questionnaire:**

<p>The most important thing I gained from this or my work with this script was:</p>	
<p>What I liked the most:</p>	
<p>What made it difficult for me:</p>	
<p>Through my work with this scenario, what knowledge or skills have I gained that will be useful to me in my life?</p>	
<p>What new did I learn from the implementation of this scenario?</p>	
<p>What would I change in the implementation of the scenario to make it even better?</p>	



## 8 Extensions of the script

- The skills acquired by the students can be used to record geomorphological elements of their area.
- The school's action group presents the work and its results to the local community and other schools and supports corresponding actions.
- We invite specialists in the field of construction and robotics at the school, present them our work and get feedback from them.
- The scenario is structured for the application of experiential exploratory approaches, with students working in groups. This structure of work can be the occasion for the introduction of corresponding approaches in the educational practice of the school.

## 9 References

A school crisis management plan is a document that outlines the procedures and protocols that a school will follow in the event of an emergency or crisis situation. The plan should be comprehensive and cover a wide range of scenarios, including natural disasters, medical emergencies, and violent incidents.

Here are some examples of what a school's crisis/disaster management plan may include:

- Emergency response procedures
- Communication protocols
- Evacuation procedures
- Lockdown procedures
- Shelter-in-place procedures
- Medical emergency procedures
- Fire safety procedures

Identifying the main evacuation routes and planning a second way to exit from each room or area.

You can find more information on how to create a school crisis management plan here:

- [NEA School Crisis Guide 2018.pdf](#)
- [Step-by-Step Guide to Writing a Crisis Management Plan | Smartsheet](#)
- [How to Write an Emergency Evacuation Plan | SafetyCulture](#)
- [A Model for School-based Crisis Preparedness and Response \(ojp.gov\)](#)
- [Earthquake Preparedness and Response - Preparedness | Occupational Safety and Health Administration \(osha.gov\)](#)
- [Poster EARTHQUAKE-PANDEMIC 33X48 FRENCH.cdr \(oasp.gr\)](#)
- [O.A.Σ.Π. \(oasp.gr\)](#) (in Greek)
- [Poster EARTHQUAKE-PANDEMIC 33X48.cdr \(oasp.gr\)](#) (in Greek)

- [OASP Protocole d'actions sur la Gestion du Risque Sismique dans un Établissement Scolaire 2021-2022 FRENCH.pdf](#)
- [Crisis Management in Schools | Plan & Examples | Study.com](#)

ArUco markers are a type of fiducial marker that are used in computer vision applications to determine the position and orientation of an object<sup>1</sup>. They are similar to QR codes in that they are both machine-readable labels that can be used to identify and track objects. However, there are some differences between the two. For example, ArUco markers help the camera to understand the angle, height, depth, and other parameters and finds its use case in cool computer vision and augmented reality tasks<sup>1</sup>. Information on the design and use of ArUco makers can be found here:

- <https://www.youtube.com/watch?v=qMAauMZgiZo>
- [Augmented Reality using Aruco Marker Detection with Python OpenCV - MLK - Machine Learning Knowledge](#)
- [Beginner: Tracking with Aruco Markers & QR codes - Rhino and Grasshopper / Tutorials - Fologram](#)
- [computer vision - AprilTag vs Aruco markers - Robotics Stack Exchange](#)