



Indoor-Outdoor Positioning
for Emergency Staff

Grant Agreement No. 874391

D5.1: CPE exercises operations plan

Lead contractor: PCF

Date: 06/05/2021

Document status

Call (part) identifier	UCPM-2019-PP-AG
Topic	UCPM-2019-PP-PREP-AG Preparedness in civil protection and marine pollution
Grant Agreement Number	874391
Project Acronym	IOPES
Project Title	Indoor-Outdoor Positioning for Emergency Staff
Deliverable Number	D5.1
Title of the Deliverable	CPE exercises operations plan
Work Package	WP5
Type	Report
Due date	06/05/2021
Issue date	06/05/2021
Version	1.2
Lead beneficiary	PCF, FBBR
Contributors	David Martín, Cèlia Conde, Jesper Bachmann
Reviewers	Jesper Bachmann, M. Eulàlia Parés
Dissemination level	Public



This project has received funding from the European Commission, Directorate-General Humanitarian Aid and Civil Protection (ECHO), under the call UCPM-2019-PP-AG.

Revision history

Version	Date	Description
1.0	15/03/2021	First draft
1.1	08/04/2021	First complete version
1.2	06/05/2021	First version

Disclaimer

The content of this report represents the views of the author only and is his/her sole responsibility. The European Commission does not accept any responsibility for use that may be made of the information it contains.

Table of Contents

List of acronyms	1
1. Executive summary	2
2. IOPES concept in brief	3
3. Objectives	4
4. Exercise preparation design	5
4.1. Approach for the creation of scenarios	5
4.2. Exercise deployment	5
4.3. Emergency scenarios	6
4.3.1. Forest fire	6
4.3.2. Chemical spill	7
4.3.3. Flash flooding	7
4.3.4. Earthquake	7
4.4. Exercise roles	7
4.5. Exercise preparation activities	8
4.6. Exercise broadcast	8
4.7. Main constraints and risks	9
5. Exercise evaluation strategy	10
5.1. Evaluation objectives	10
5.2. End-Users' feedback	10
6. Reference documents	12

List of figures

Figure 2-1. IOPES concept.	3
---------------------------------	---

List of acronyms

CoU	Community of Users
CPET	Civil Protection Emergency Teams
EMS	Emergency Management System
GIS	Geographic Information Systems
ICS	Incident Command System
IPR	Intellectual Property Rights
LTE	Long Term Evolution
PR	Press Release
RPAS	Remotely Piloted Aircraft System
UAV	Unnamed Aerial Vehicles
WP	Work Package
Project partners	
ATH	ATHONET SRL
CATUAV	CATUAV SL
CTTC	Catalan Tecnological Telecommunications Centre
FBBR	Frederiskborg Fire and Rescue Service
PCF	Pau Costa Foundation
SAREye	SAREye EHF
SCARABOT	Scarabot Technologies GmbH

1. Executive summary

This document sets the objectives of the functional exercise of the IOPES project, describes the exercise preparation design, and defines the evaluation strategy. Two functional exercises are planned to test and validate the innovative technologies developed in IOPES, one in Collsuspina (Spain), in May 2021, and another in Mosbach (Germany), in October 2021. Each exercise will be deployed as small-scale field emergency scenarios that will deploy a series of realistic emergency scenarios under controlled conditions. Finally, end-user feedback sessions will be conducted with all emergency services attending the exercise to validate and improve the IOPES technology.

2. IOPES concept in brief

The IOPES project aims to increase the safety and efficiency of the CPETs (Civil Protection Emergency Teams) in the course of emergency operations resulting from human-made and natural disasters. To achieve that, the project develops and enhances operationally oriented technologies that are targeted to provide precise and detailed information about a hazardous environment that can drastically change where it becomes paramount to safeguard the lives and the physical integrity of the operatives in the field.

The IOPES technology relies on four pillars:

- RPAS-based fast mapping tool.
- Wearable positioning device.
- LTE/ 5G deployable communications.
- Mature EMS (Emergency Management System).

The combined use of these technologies will assist in better tracking the positions of the members of emergency teams, both in indoor and outdoor environments, which could help improve the CPETs situational awareness and facilitate their decision making during disaster-related operations.

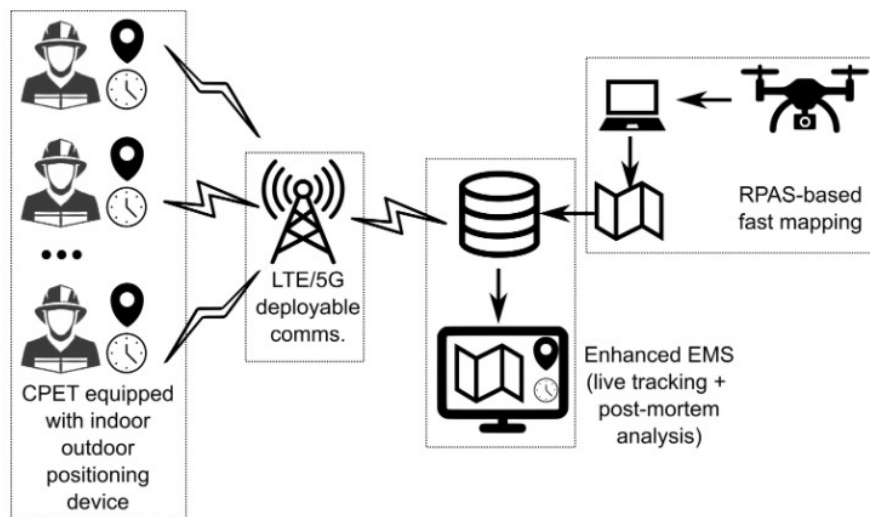


Figure 2-1. IOPES concept.

3. Objectives

The aim of the IOPES functional exercises is to test and validate the innovative technologies developed in the project in a simulated environment under controlled (not hazardous) conditions. Specific objectives are:

- Design realistic and dynamic emergency scenarios consisting of compromised situations where Search and Rescue operation are required.
- Deploy these scenarios in a small-scale field test involving the participation of end-user organisations.
- Showcase how the IOPES technology can be used in real emergency situations and the value it can provide to the end-users.
- Gather feedback (i.e., opinion and evaluation) from end-user organisations invited in order to identify current strengths and limitations leading to further refinement of the technology.

4. Exercise preparation design

In total, two functional exercises will be organised withing the project lifetime: the first in Collsuspina (Spain), in May 2021, and the second one in Mosbach (Germany), in October 2021.

The following sub-sections provide detailed information about the exercise approach and set-up.

4.1. Approach for the creation of scenarios

The creation and deployment of the exercise scenarios is underpinned by emergency management knowledge base obtained from the consultation with end-users from inside the Consortium (i.e., FBBR) as well as other end-user organisations involved in operational emergency management. Thus, it draws from the end-users' experience itself, but also from information, lessons learnt, and best practices identified along their active management of a variety of incidents.

The scenarios created will represent the knowledge and experience of specific end-user profiles: Fire and Rescue Service, Civil Protection, and emergency authorities working from Command & Control centres. The situations will be represented:

- Communication between operators at the Command & Control centres and first responders in the field
- “Request for assistance” situations
- Displacement of first responders from safe areas to
- Search and Rescue operations
- Operations in areas with poor signal reception or no reception at all

4.2. Exercise deployment

Each functional exercise is composed by one or more emergency scenarios (see section 4.3). While each of them deploys different hazard situations involving search and rescue operations, they all follow a common structure that is designed to use and showcase the IOPES technology in an orderly way in line with the requirements at each stage of the emergency. The structure refers to the sequence of the scenes starting with the emergency context until the rescue operations are performed. The structure is outlined below but can be embedded as part of the exercise scrip in the deliverable *D5.1 Scrip for field tests in ES, DE*
Error! No se encuentra el origen de la referencia.:

Scene 1: Hazard emergency context. A general description of the emergency scenario is provided by a storyteller.

Scene 2: Drone fast mapping over the affected area. Drones taking off, flying over the BCN drone centre premises to film the area, and landing.

Scene 3: Mapping processing and visualisation. The high-resolution ortophotomaps produced through fast mapping techniques with drones are ready for visualisation on the computer. Drone experts of CATUAV explain how these images are sorted out, examined, and uploaded to the EMS.

Scene 4: Rescue equipment setup. The rescuer or rescuers arrives at the scene, turns on the bag pack and puts on the helmet.

Scene 5: Emergency operations. The rescuers or rescuers arrive at the incident site, heads towards the victims and performs the search and rescue operations. A description of the rescue operations that will be performed during the exercise is provided in sections 4.3.1, 4.3.2, 4.3.3 and 4.3.4 respectively in each of the emergency scenarios.

4.3. Emergency scenarios

The functional exercises will be deployed as small-scale field emergency scenarios that will deploy a series of emergency scenarios. Each emergency scenario consists of pre-defined search and rescue operations, combining both outdoor (fields, forests) and indoor (houses, buildings, and natural caves) environments.

In total 4 emergency scenarios have been designed, three of which will be deployed in the frame of the first exercise, in Collsuspina (Spain), and another one in Mosbach (Germany):

- Scenario 1: Forest fire (Collsuspina, Spain)
- Scenario 2: Chemical spill (Collsuspina, Spain)
- Scenario 3: Flash flood (Collsuspina, Spain)
- Scenario 4: Earthquake (Mosbach, Germany)

The reason why only one scenario is planned for Mosbach is because the settings where the exercise will take place, the training Center of *Retten und Helfen*, has the recreation of an earthquake scenario, and therefore it is very suitable for the representation of this type of hazard. Earthquakes are one of the main target hazards of IOPES, and therefore the second functional exercise will consist of various earthquake hazard-related scenes.

4.3.1. Forest fire

Duration: 15 min approx.

Settings: facilities of the BCN drone centre and surroundings

Story description: Forest fire approaching populated areas at risk. The following operations will be performed:

- Workers at the BCN drone center are at risk and need to be evacuated. Emergency services enter the facilities to alert the workers on the need to evacuate, making sure they leave the area promptly and in an orderly manner.
- A vehicle trying to escape from the fire goes out of control and plunges over a hillside. The vehicle occupants are injured and need to be rescued. Emergency services search the victims through the forest until they find them.

4.3.2. Chemical spill

Duration: 10 min approx.

Settings: Colluspina village

Story description: The entire village of Colluspina is submitted to a severe chemical exposure as a result of a spill in a nearby chemical plant. The following operations will be performed:

- Several disabled people in the city hall require assistance to be evacuate off-site. Emergency services enter the city hall, check the people in each room and make sure everyone leave the area promptly and in an orderly manner.

4.3.3. Flash flooding

Duration: 20 min approx.

Settings: Coves del Toll – Torrent Mal

Story description: Rapid overflow of the stream Torrent Mal that affects the caves area. The following operations will be performed:

- The rise in the water level leaves some people trapped on the other side of the river and inside the caves area without any chances to return to the main road. People inside the caves are scared and are unable to get out by themselves.

4.3.4. Earthquake

Duration: 1 hour approx.

Settings: TCRH Mosbach

Story description: Rescue in a village after an earthquake that destroy some houses. The following operations will be performed:

- Several injured people in the buildings require assistance to be evacuate off-site. Emergency services enter the buildings, check the people in each room and make sure everyone leave the area promptly.

4.4. Exercise roles

The entire IOPES Consortium will be engaged in the organisation and deployment of the exercise, each partner holding a key role towards a successful performance. The roles held by each partner are outlined below:

- **OWNER (CTTC).** Tasks: supervise the overall planning and execution of the exercise.

- **ORGANISER (PCF).** Tasks: Prepare, design, and deploy of realistic scenarios a controlled environment, coordinate the execution of the exercise, and support exercise participants in their tasks during the exercise.
- **HOST (CATUAV in Colluspina and SCARABOT in Mosbach).** Tasks: Propose the most appropriate settings for the exercises, trigger the involvement of local emergency authorities, take care of the logistics (i.e., distribution of all the material needed for the execution of the exercise, the provision of catering...), and be attentive to the needs that the attendees may have.
- **EXERCISE PARTICIPANTS (FBBR and other end-users).** Tasks: Perform the emergency operations of the exercises. Notably, FBBR, as end-user of the Consortium, will assist the organiser with the preparation of the script to make sure they are based on real emergency situations and experiences on the field.
- **DISSEMINATION LEADER (PCF).** Tasks: Announce the event in the Social media during the previous days and publish pictures and highlights during the exercise.
- **TECHNICAL PARTNERS (CTTC, ATHONET, CATUAV, SAREYE, SCARABOT).** Tasks: ensure the readiness of the IOPES technology in line with the goals of the exercises, and provide permanent technical assistance to the owner, organiser, and host during the exercise preparation.
- **CAMERA OPERATORS (ZEBA company).** Tasks: film and record the development of the exercise and prepare the post-production during the day after the exercise.

Finally, the exercise will be followed by several observers from the field of civil protection. Some local authorities will be invited to follow the exercise live on-site, whereas other will be able to watch it on YouTube once the recording is edited and uploaded shortly after the event (see section 4.6).

4.5. Exercise preparation activities

To assure a good performance of the functional exercise, the preparation will start the months prior to the exercise and will mainly involve the exercise owner, organiser, and host. However, the rest of the Consortium members will be occasionally involved assisting with the preparation activities: i.e., technical partners will provide technical assistance to guarantee the readiness of the IOPES technology, whereas the project end-user FBBR will provide guidance with the preparation of realistic emergency scenarios and operations.

As part of the preparation activities, it is worthwhile to highlight that there will be a general rehearsal during the day prior to the exercise that will be conducted as a dry-run, i.e., performing step-by-step all the actions as in the real exercise.

4.6. Exercise broadcast

The development of the first functional exercise in Collsuspina (Spain) will be recorded, post-produced, and broadcast on Youtube shortly after the exercise. Moreover, during the day that the recordings will be made, there will be a screen so that the physical attendees can watch with detail the live execution of the exercise operations that will be performed around the area.

To do so, an audio-visual company will be hired that will actively participate during the preparation of the exercise alongside the members of the Consortium to identify all the requirements for the recording.

4.7. Main constraints and risks

Main constraints and risks for failing with the objectives of deployment and evaluation of the functional exercises concern organizational, technical and end-user needs-related aspects.

Organizational

- Not to get the necessary permissions to access some of the key setting where some emergency scenarios are expected to take place, namely the caves “Coves del Toll” (in Collsuspina), and the training Center of “Retten und Helfen” (in Mosbach).
- Adverse weather conditions, particularly rain, that prevent the organisation of the exercises in the field and flying drones.
- Due to current and foreseen restrictions by COVID-19, the attendance to the exercise will be limited to the organizers, participants and a few local emergency authorities.

Technical

- To fail in setting up the portable LTE communication network.
- Lack of reception in critical areas (e.g., caves or buildings, forests, remote areas) to obtain seamless position information from the participants.
- Lack of reception in critical areas (e.g., caves or buildings, forests, remote areas) to provide live broadcast of the emergency operations for the physical observers.
- Technical issues to set up and fly drones.

End-users feedback

- Lack of engagement of end-user organisations.
- IOPES technology do not satisfy all end-user operational needs.
- Lack or insufficient feedback from end-users to work on the further refinement of the technology.

5. Exercise evaluation strategy

Emergency services attending the functional exercises, both as participants and observers, will be asked to provide their feedback to evaluate the usefulness of the IOPES technology and propose improvements.

The advantage of having emergency services attending the functional exercise lies in the fact that they are potential end-users of the IOPES technology. In order to maximise the richness of the feedback collected from the end-users, a variety of personnel from various emergency management organisations will be invited with experience and knowledge on the following key areas:

- Emergency management organization
- Incident Command System (ICS)
- Technical expertise (radio communication, cartography software, etc.)
- UAV technology
- Geographic Information Systems (GIS)

5.1. Evaluation objectives

The main objectives of the evaluation are:

- Validation of the IOPES technological components based on their use in emergency management scenarios. I.e., What went well and what went wrong in using these technologies in a small-scale field exercise?
- Evaluation of the adaptability of the technology/implementation to any type of emergency situations. I.e., Can these technologies be used in any kind of emergency situations resulting from human-made and natural hazards? If not, please name which ones.
- Evaluation of the technology transfer to emergency services. I.e., Can these technologies be easily employed by your organisation to improve situational awareness and support decision making processes?
- Advantages and limitations in the functionalities. What are the advantages and limitations of the functionalities of these technologies?
- Compatibility with existing tools. Are these technologies compatible in use with other exiting tools currently available and well-established at your organisation?

5.2. End-Users' feedback

The evaluation of end-users will be compiled by means of a dedicated online questionnaire. One questionnaire will be designed for both functional exercises, however the questionnaire for the second exercise might be refined based on the results obtained from the first one.

The evaluation process and the design of the evaluation form will be aligned with the above objectives (see section 5.1)

The end-user's evaluation form will address each of the IOPES technologies:

- RPAS-based fast mapping tool
- Wearable positioning device
- LTE/ 5G deployable communications
- Mature EMS (Emergency Management System)

Through this questionnaire, end-users will be able to check the achievement and applicability, as well as validate all requirements gathered in IOPES deliverable D3.1 User requirements report [2].

6. Reference documents

- [1] IOPES (2021). *D5.2 Scrip for field tests in ES, DE.*
- [2] IOPES (2021). *D3.1 User requirements report.*

IOPES

Indoor-Outdoor Positioning
for Emergency Staff