



Task 02/A2

Structuring the main 10 key risk situations



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INDEX

INTRODUCTION	3
SITUATION 1	4
SITUATION 2	4
SITUATION 3	5
SITUATION 4	6
SITUATION 5	7
SITUATION 6	8
SITUATION 7	9
SITUATION 8	10
SITUATION 9	11
SITUATION 10	12



INTRODUCTION

One of the main pillars of this project was the creation of an interactive multimedia learning tool available to all workers in the construction sector, with the main objective of creating safe working environments for the use of robotic machinery. A central factor is the accident due to being run over, as well as high noise levels or electric shocks, which are very frequent in this sector. To avoid such accidents, it is important to be aware of the risks involved in the use of such machinery.

For this reason, it was necessary to develop a tool to raise awareness of the existing risks derived from the application and use of these machines, and to make available to the educational and professional community all the necessary training materials, as well as to take advantage of the different possibilities offered by new technologies as a means of dissemination and visualisation of the materials produced.

This report is included in the task "O2/A3. Production of the scripts of the virtual reality (VR) immersive safety training environment", corresponding to Intellectual Output 2 "Production of Virtual Training Tool" of the SafeCRobot project.

For the realisation of this task, he has had the support of all the partners in the production of the scripts (story board).

Each script includes the details: where the situation takes place, characters, full explanation of the background, action to be carried out, etc. The partners have reviewed the scenarios and made contributions and improvements.

The scenarios have been approached from an interactive point of view to make the training tool attractive to workers. In these scenarios, appropriate actions to achieve a safe and environmentally sustainable workplace are shown.

The report and all the information about the project are available in the following url:

- SafeCRobot project web: <https://safecrobot.pwr.edu.pl/en/>



SITUATION 1

Drones (Unmanned Aerial Vehicle) – Preparing for flights on construction sites in day light

SITE:	Office container on a construction site
ROBOT:	Drones (Unmanned Aerial Vehicle)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Operator falling from height - Distraction of workers - Collision - Device failure - Losing control of the device - Falling or hitting a ground obstacle or a person - Hazards resulting from the local terrain conditions and weather conditions - Third parties / animals - Fire hazard - Electric shock - Falls to the same level, tripping - Blows, cuts <p>Chemical risks:</p> <ul style="list-style-type: none"> - Dust inhalation <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	The objective of this mission is to observe the different elements that can be found in the construction office. After that the user will have to answer the questions in order to make the right decision for the use of drones. These questions refer to the preparation of the environment to fly the drone.

SITUATION 2

Drones (Unmanned Aerial Vehicle) – Flight by unmanned aerial vehicle during favourable weather conditions.

SITE:	Construction site
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ROBOT:	Drones (Unmanned Aerial Vehicle)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Operator falling from height - Distraction of workers - Collision - Device failure - Losing control of the device - Falling or hitting a ground obstacle or a person - Hazards resulting from the local terrain conditions and weather conditions - Third parties / animals - Fire hazard - Electric shock - Falls to the same level, tripping - Blows, cuts <p>Chemical risks:</p> <ul style="list-style-type: none"> - Dust inhalation <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	<p>During this scenario the user will take on the role of a pilot of an unmanned aerial vehicle (UAV). The task will be to carry out a mission (construction site raid) using a drone during a bright and sunny day. During the raid, the user must pay attention to surroundings and the messages appearing on the controller screen regarding the technical parameters of the flight.</p>

SITUATION 3

Drones (Unmanned Aerial Vehicle) – Flight by unmanned aerial vehicle during adverse weather conditions.	
SITE:	Construction site
ROBOT:	Drones (Unmanned Aerial Vehicle)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Operator falling from height - Distraction of workers - Collision

	<ul style="list-style-type: none"> - Device failure - Losing control of the device - Falling or hitting a ground obstacle or a person - Hazards resulting from the local terrain conditions and weather conditions - Third parties / animals - Fire hazard - Electric shock - Falls to the same level, tripping - Blows, cuts <p>Chemical risks:</p> <ul style="list-style-type: none"> - Dust inhalation <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	<p>During this scenario, the user will take on the role of a pilot of an unmanned aerial vehicle (BSP). The task will be to carry out a mission (construction site raid) using a drone during adverse weather conditions, including wind, rain. During the raid, the user must pay attention to the environment and the messages appearing on the controller's screen regarding the technical parameters of the flight.</p>

SITUATION 4

Drones (Unmanned Aerial Vehicle) – Preparing to fly an unmanned aerial vehicle (drone) at night	
SITE:	Office container on a construction site
ROBOT:	Drones (Unmanned Aerial Vehicle)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Operator falling from height - Distraction of workers - Collision - Device failure - Losing control of the device - Falling or hitting a ground obstacle or a person - Hazards resulting from the local terrain conditions and weather conditions - Third parties / animals - Fire hazard - Electric shock

	<ul style="list-style-type: none"> - Falls to the same level, tripping - Blows, cuts <p>Chemical risks:</p> <ul style="list-style-type: none"> - Dust inhalation <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	<p>During this scenario the user will take on the role of a pilot of an unmanned aerial vehicle (UAV). The task will be to properly prepare to fly at night on a construction site. The user is located in the construction office. In the container he will find the following equipment: a drone, a set of charged batteries, a tablet, construction documentation, additional lighting. Look around the office and get ready to fly.</p>

SITUATION 5

Autonomous Site Transport Vehicle – Indoor site conditions	
SITE:	Inside of a building (Construction site)
ROBOT:	Autonomous Site Transport Vehicle (STCV)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Falls to the same level, tripping. - Falls to different levels. - Blows or crushing due to falls of transported cargo. - Collisions, crashes, blows or crushing by mobile machinery. - Entrapments, blows and cuts. <p>Chemical risks:</p> <ul style="list-style-type: none"> - Inhalation of fumes or gases from machinery. <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	<p>This module introduces the user to health and safety requirements for operating Autonomous Transport Vehicles (ATV) in construction indoor site conditions. ATV is a vehicle capable of operating on its own. They are usually wheeled or tracked and vary in size. For indoor transport, ATVs are normally small-medium sized. Assume the ATV used in this module is electric and has the following dimensions: L-1200mm, H-600mm and W-700mm and can carry loads up to 500kg. Please observe the environment and the equipment to identify any issues you consider as health and safety risks. Consider some of the</p>

	most important safety issues for managing an ATV on a construction site then answer questions in the quiz within the scene.
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SITUATION 6

Autonomous Site Transport Vehicle – External and outdoor site conditions	
SITE:	Construction site
ROBOT:	Autonomous Site Transport Vehicle (STCV)
ASOCIATED RISKS:	<p>Safety risks:</p> <ul style="list-style-type: none"> - Falls to the same level, tripping. - Falls to different levels. - Blows or crushing due to falls of transported cargo. - Collisions, crashes, blows or crushing by mobile machinery. - Entrapments, blows and cuts. <p>Chemical risks:</p> <ul style="list-style-type: none"> - Inhalation of fumes or gases from machinery. <p>Physical risks:</p> <ul style="list-style-type: none"> - Noise
INTRODUCTION:	<p>This module introduces the user to health and safety requirements for operating Autonomous Transport Vehicles (ATV) in construction external or outdoor site conditions. ATV is a vehicle capable of operating on its own. They are usually wheeled or tracked and vary in size. For external or outdoor site activities ATVs vary from small to very large equipment. The ATV used in this scene is a large dumper used for transporting material on site. Typical materials include aggregate, excavated or demolished material.</p> <p>User must observe the environment and the equipment to identify any issues you consider as health and safety risks. And consider some of the most important safety issues for managing an ATV on a construction site then answer questions in the quiz within the scene.</p>



SITUATION 7

Action scenario for remote-controlled robots using the example of a demolition robot (General Handling)	
SITE:	Construction site
ROBOT:	Demolition robot
ASOCIATED RISKS:	<p>Manipulation of safety devices (sensors):</p> <ul style="list-style-type: none"> - Consciously within the context of set-up and maintenance - Unknowingly due to operating errors <p>Overturning:</p> <ul style="list-style-type: none"> - Unevenness of the surface - Too much inclination - Loads too great - Incorrect assessment of the demolition materials (too firm, too hard, too massive) <p>Incorrectly estimated or unforeseen robot movements:</p> <ul style="list-style-type: none"> - Knocking people over, - Bruises - Contusions - Pinching - Running over the feet <p>Uncontrolled flying around of demolition material:</p> <ul style="list-style-type: none"> - Severe injuries to the entire body <p>Improper maintenance (tool change, lubrication).</p>
INTRODUCTION:	<p>This module introduces the user to health and safety requirements for operating a remote-controlled demolition robot in construction site conditions (indoor and outdoor).</p> <p>Contractor Smith mandates two of his employees, Marc and Gordon, to demolish several walls inside a large industrial factory. A remote-controlled demolition robot is to be used. The hydraulic hammer has already been mounted. Marc and Gordon have never worked with a demolition robot before but are really looking forward to it.</p> <p>The user must join Marc and Gordon on their job and find out the health and safety risks when working with the demolition robot.</p> <p>Then check and consolidate your knowledge by working through the quiz.</p>



SITUATION 8

Remote-controlled robots using the example of a demolition robot (Handling of demolition robots **inside** of the building)

SITE:	Inside of a building (Construction site)
ROBOT:	Demolition robot
ASOCIATED RISKS:	<p>Manipulation of safety devices (sensors):</p> <ul style="list-style-type: none"> - Consciously within the context of set-up and maintenance - Unknowingly due to operating errors <p>Overturning:</p> <ul style="list-style-type: none"> - Unevenness of the surface - Too much inclination - Loads too great - Incorrect assessment of the demolition materials (too firm, too hard, too massive) <p>Incorrectly estimated or unforeseen robot movements:</p> <ul style="list-style-type: none"> - Knocking people over, - Bruises - Contusions - Pinching - Running over the feet <p>Uncontrolled flying around of demolition material:</p> <ul style="list-style-type: none"> - Severe injuries to the entire body <p>Improper maintenance (tool change, lubrication).</p>
INTRODUCTION:	<p>This module introduces the user to health and safety requirements for operating a remote-controlled demolition robot in construction site conditions (indoor).</p> <p>Contractor Smith mandates two of his employees, Marc and Gordon, to demolish several walls inside a large industrial factory. A remote-controlled demolition robot is to be used. The hydraulic hammer has already been mounted. Marc and Gordon have never worked with a demolition robot before but are really looking forward to it.</p> <p>Please join Marc and Gordon on their job and find out the health and safety risks when working with the demolition robot.</p> <p>Then check and consolidate your knowledge by working through the quiz.</p>



SITUATION 9

Action scenario for remote-controlled robots using the example of a demolition robot (Handling of demolition robots **outside** of the building)

SITE:	Construction site
ROBOT:	Demolition robot
ASOCIATED RISKS:	<p>Manipulation of safety devices (sensors):</p> <ul style="list-style-type: none"> - Consciously within the context of set-up and maintenance - Unknowingly due to operating errors <p>Overturning:</p> <ul style="list-style-type: none"> - Unevenness of the surface - Too much inclination - Loads too great - Incorrect assessment of the demolition materials (too firm, too hard, too massive) <p>Incorrectly estimated or unforeseen robot movements:</p> <ul style="list-style-type: none"> - Knocking people over, - Bruises - Contusions - Pinching - Running over the feet <p>Uncontrolled flying around of demolition material:</p> <ul style="list-style-type: none"> - Severe injuries to the entire body <p>Improper maintenance (tool change, lubrication).</p>
INTRODUCTION:	<p>This module introduces you to health and safety requirements for operating a remote-controlled demolition robot in construction site conditions (outdoor).</p> <p>Contractor Smith mandates two of his employees, Marc and Gordon, to demolish several walls inside a large industrial factory. A remote-controlled demolition robot is to be used. The hydraulic hammer has already been mounted. Marc and Gordon have never worked with a demolition robot before but are really looking forward to it.</p> <p>Please join Marc and Gordon on their job and find out the health and safety risks when working with the demolition robot. Then check and consolidate your knowledge by working through the quiz.</p>



SITUATION 10

Remote Controlled Equipment (Diggers/excavators) - External and outdoor site conditions	
SITE:	Construction site
ROBOT:	Diggers/Excavators
ASOCIATED RISKS:	<p>Manipulation of safety devices (sensors):</p> <ul style="list-style-type: none"> - Consciously within the context of set-up and maintenance - Unknowingly due to operating errors <p>Overturning:</p> <ul style="list-style-type: none"> - Unevenness of the surface - Too much inclination - Loads too great - Incorrect assessment of the demolition materials (too firm, too hard, too massive) <p>Incorrectly estimated or unforeseen robot movements:</p> <ul style="list-style-type: none"> - Knocking people over, - Bruises - Contusions - Pinching - Running over the feet <p>Uncontrolled flying around of demolition material:</p> <ul style="list-style-type: none"> - Severe injuries to the entire body <p>Improper maintenance (tool change, lubrication).</p>
INTRODUCTION:	<p>This module introduces you to health and safety requirements for operating remote controlled equipment using Diggers/Excavators as an example. The scenario depicts construction in external or outdoor site conditions. An excavator or digger is a piece of equipment consisting of a boom, dipper, bucket and a cab on a rotating platform. They are primarily used for digging and excavation of material. They are usually wheeled or tracked and vary in size. The excavator used in this scene is medium sized.</p> <p>Please observe the environment and the equipment to identify any issues you consider as health and safety risks. Consider some of the most important safety issues for managing an remote controlled digger/excavator on a construction site then answer questions in the quiz for the scene.</p>