

**PROJET EUROPÉEN H2020**

**EQUIPE RECHERCHE STI CEREMA**



# AWARD

Scaling autonomous logistics

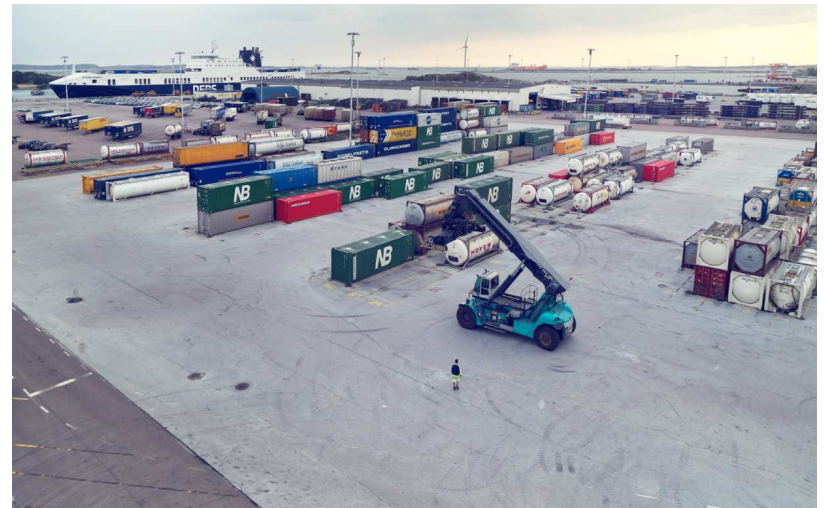
**[ALL WEATHER AUTONOMOUS REAL LOGISTICS OPERATIONS  
AND DEMONSTRATIONS]**

# Contexte

Contact Easymile (communications variées, NFI, final event DENSE)  
Démarche engagée depuis fin 2019, montage de projet express  
Secteur d'activité : Logistique et Transport

## Enjeux :

- niveaux de sécurité à garantir,
- outrepasser les aléas météorologiques,
- fixer un cadre réglementaire.



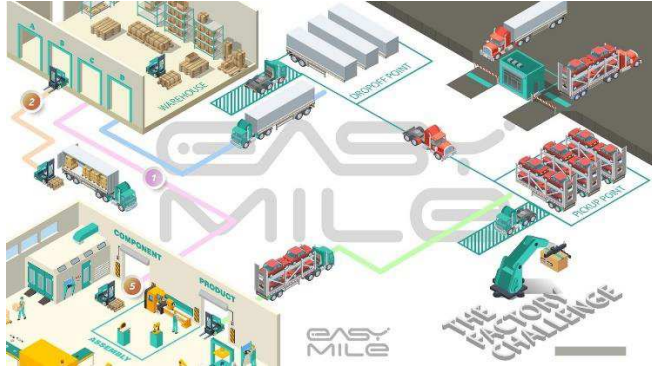
*Crédit photo : DFDS*

# Modalités de contractualisation

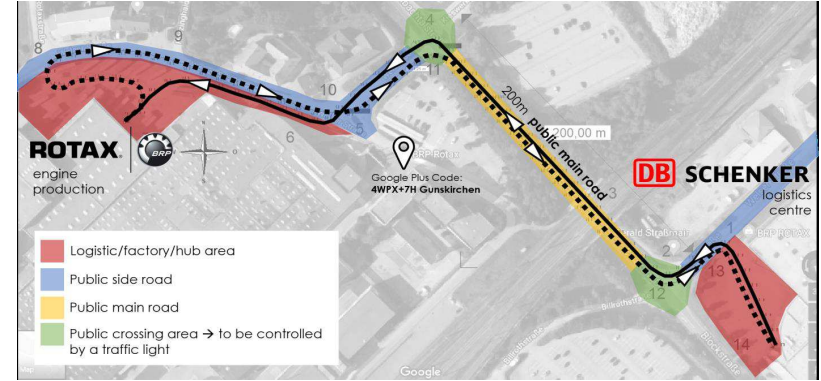
Projet européen H2020  
29 partenaires  
Coordinateur : Easymile



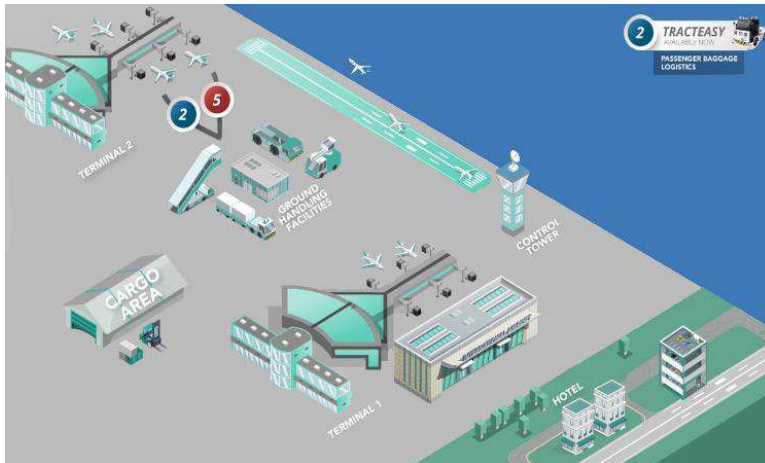
# Lieux de cas d'usage



Easymile – Toulouse - France



Rotax/Schenker – Gunskirchen - Autriche



Avinor - Oslo - Norvège



DFDS - Rotterdam – Pays-bas

## Prestation :

- analyse des besoins exprimés par les acteurs de la logistique,
- définition des caractéristiques fonctionnelles du système de transport,
- spécification des conditions météorologiques dégradées à prendre en compte,
- mise en place des protocoles et réalisation des essais en conditions météorologiques dégradées,
- développement de la plateforme PAVIN brouillard et pluie concernant la production des brouillards maritimes,
- études d'impact.

## Financement :

Projet européen H2020 , 720k€ de subvention pour le Cerema (sur 20M€ en tout)

## Calendrier :

Début 2021 à fin 2023.

## Equipe projet :

- 6 membres à Clermont-Ferrand : Pierre Duthon (pilote), Michèle Colomb, Frédéric Bernardin, Sébastien Liandrat, Jean-Luc Bicard, David Bicard
- 5 membres à Toulouse : Louahdi Khoudour, Guillaume Saint-Pierre, Christian Françoise, Philippe Michou, Josué Rivera

# Quelques actions en cours : WP2 - Identification des besoins des utilisateurs finaux

<https://award-h2020.eu/index.php/workshop-1/>

## AWARD workshop #1

### Automation in Freight Transport & Logistics User requirements Workshop



Organised by IRU and AIT on the 2<sup>nd</sup> of June 2021

# Quelques actions en cours : WP2 - Identification des besoins des utilisateurs finaux

<https://award-h2020.eu/index.php/award-survey-1/>



**Warehouse**

Automated goods handling within the logistics hub



**Hub-to-hub**

Hub-to-hub transport on public roads



**Airport**

Automated transport for airport baggage handling



**Port**

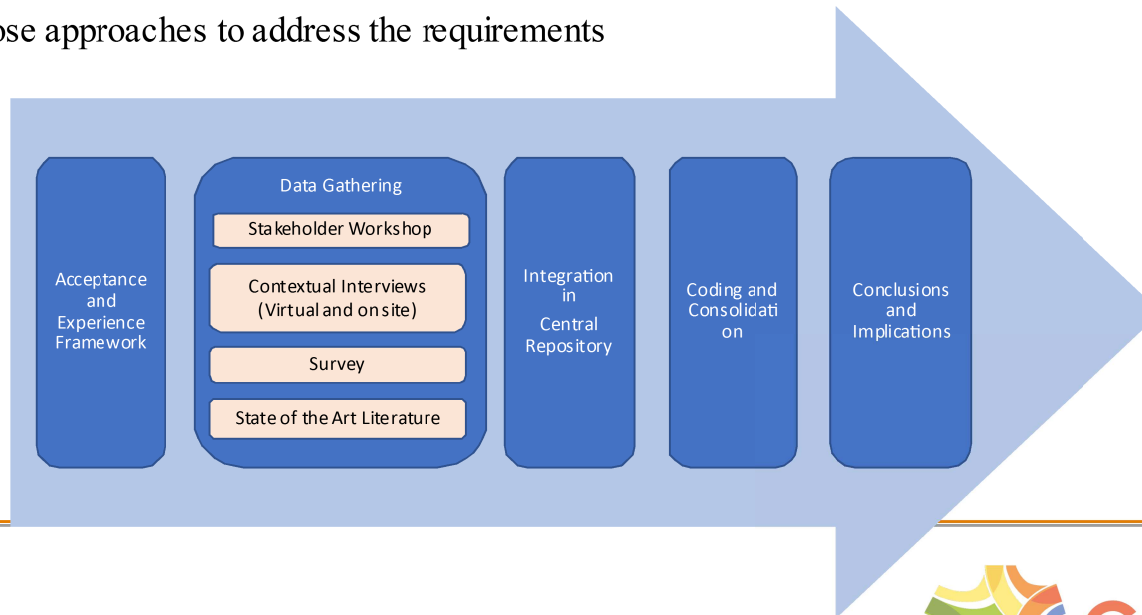
Automated trailer transfer with port terminal systems

# 1. Goals

The goals for the user and stakeholder requirements specification addressed in this document are as follows:

1. Identify factors that are relevant for a broad acceptance towards AGTS
2. Specify the requirements for users and stakeholders, based on the above analysis
3. Investigate contextual specifics (operations, stakeholder)
4. Derive implications for the functional requirements in T2.4

Propose approaches to address the requirements





**Automated  
Ground Goods  
Transport  
System  
(AGTS)**

**Logistics  
Operation &  
Fleet  
Management  
(LOFM)**

Managing operations  
of AD vehicles  
within the goods  
transportation workflow



**AD Vehicle  
(ADV)**

AD capable vehicle to  
physically perform the  
operations



**Supporting  
Infrastructure  
(SI)**

Infrastructure  
(e.g. charging stations,  
gates, traffic signs)  
to support the  
operations of the AGTS



**Supporting  
Logistics  
Systems  
(SLS)**

Logistic systems  
(e.g. forklifts, cranes)  
to support the  
operations of the AGTS



**AGTS and related systems**

## Aggregated user requirements

The presence of highly qualified personnel shall be needed to support/solve problems related to the automated system

The vehicle shall be enabled to operate in public/private areas interacting with the available digital/physical infrastructure and other traffic/road users

Training for personnel directly/indirectly involved shall be carried out

The operation of automated vehicles shall be adapted to different weather conditions

Automation shall provide safer than human actions

Impact of automation in job conditions (employment, qualification, tasks to do, etc.) shall be considered

The vehicle shall allow remote intervention / control at any time

Automation shall result in higher profitability, coming from higher productivity (24/7 operability), higher transport capacities, and optimization of movements/time (and therefore, reduction in fuel/energy consumption)

The AGTS shall be able to define a detailed route before starting operations, as well as modify it in real-time if necessary (for example, under the presence of an obstacle/accident)

The vehicle shall be eco-friendly (low noise, low CO2/GHG emissions)

The AGTS shall be robust to face external attacks (e.g. cyber-attacks), as well as prevent misuse by internal unqualified personnel

The vehicle shall guarantee at all times the safety of all the people around it

The AGTS shall be reliable and fault tolerance

The vehicle shall be equipped with an emergency system, to be stopped and/or intervened by an in-site driver

The behavior of the vehicle shall be adjusted according to external restrictions (type of area: public or private; type of road: pavement, concrete; type of relief: slope, curve)

Working unions help is needed for acceptance of the automation process

For the acceptance of the automation process, the change in working conditions (training, new job profiles), as well as the new job opportunities that it creates, shall be clearly reported

A regulatory change shall be made to consider the presence of automated vehicles

A delay time shall be considered for the implementation of the AGTS to achieve the desired performance

For the implementation of the AGTS, the opinions / suggestions / requirements of the people who will live with the vehicle on a daily basis shall be considered

A recurring physical inspection of the vehicle shall be done

The vehicle shall inform the control system (LOFM) about its movements (actions, positioning, longitudinal and lateral motion, etc.) and status (sensors, tires, fuel/energy, etc.)

The implementation of the AGTS shall comply with all the use-case specific requirements (e.g., security standards, specific workflow/actions, etc.)

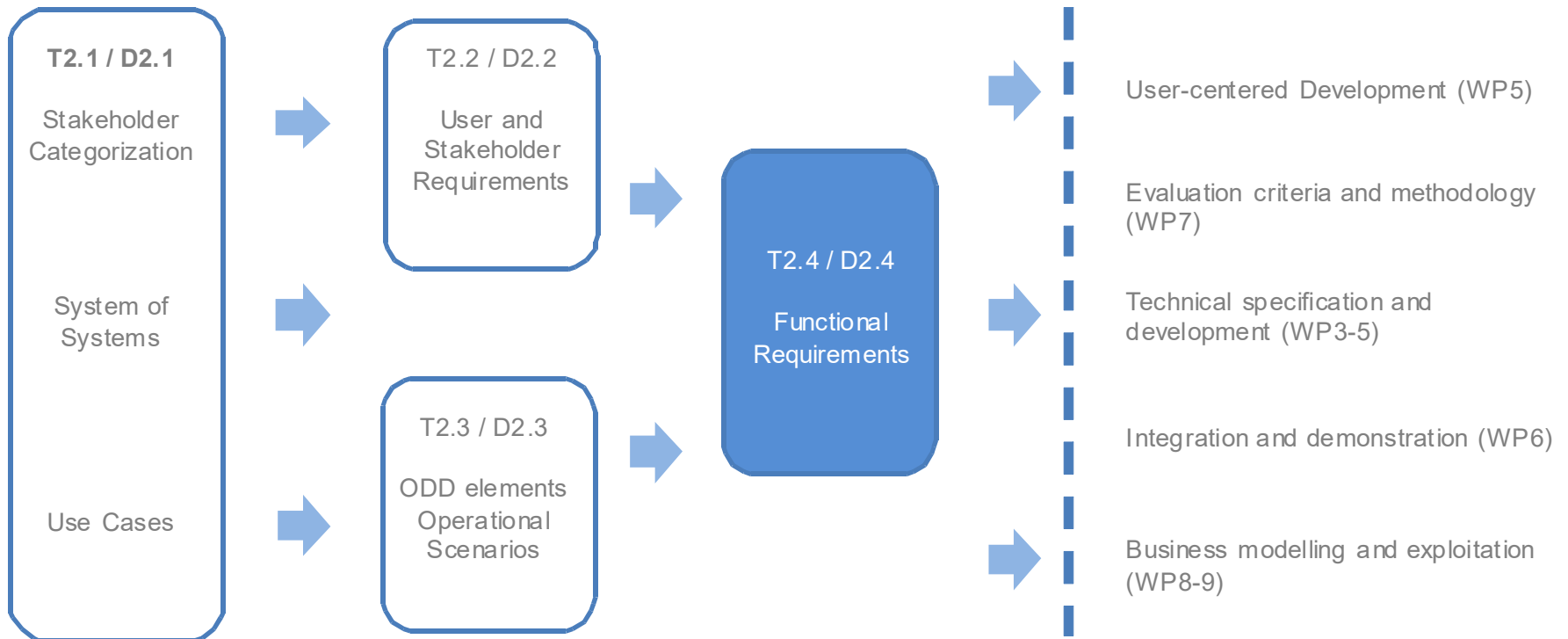
The user interface shall be user friendly

The AGTS shall be standardized to be easily implemented in other use cases

The AGTS shall be easily integrable with existing systems, avoiding any interference

Ethical and social implications shall be studied

Tasks around the vehicle shall be automated



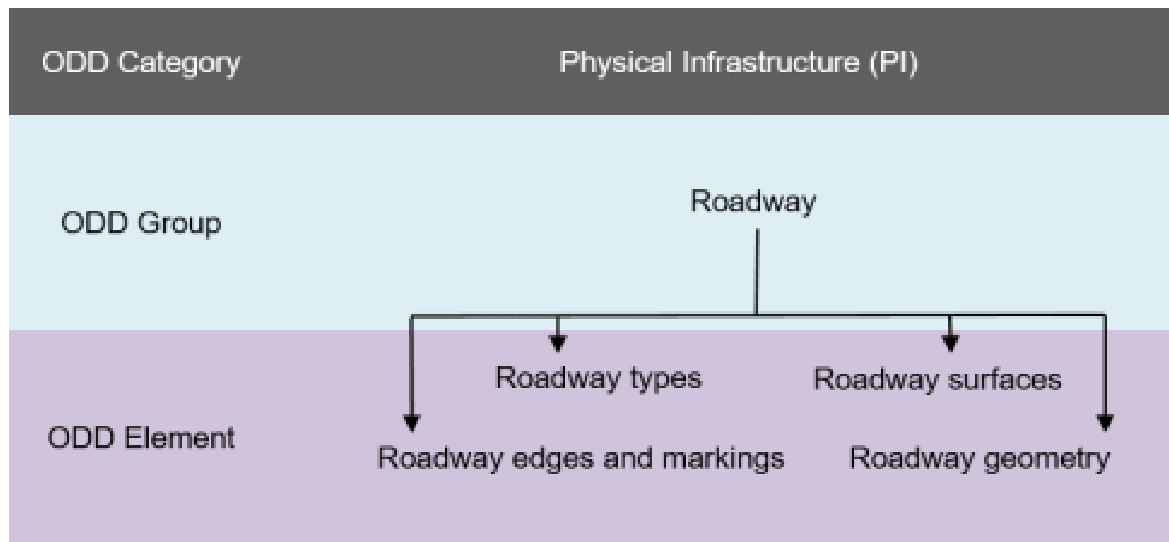
Overview of the relationship of the functional requirements definition task and deliverable (T2.4 and D2.4) within the overall requirements workpackage (WP2), and their contribution to subsequent activities in other workpackages



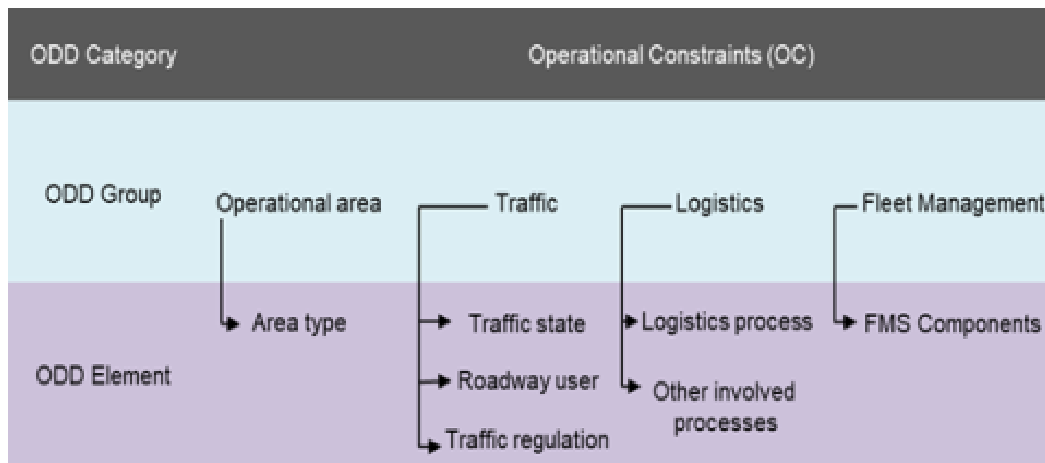
## General requirements and feedback loop

ODD Category	Physical Infrastructure (PI)	Operational Constraints (OC)		Environmental Conditions (EC)	
ODD Group	Roadway	Traffic	Operational area	Weather	Connectivity
		Logistics	Fleet Management		

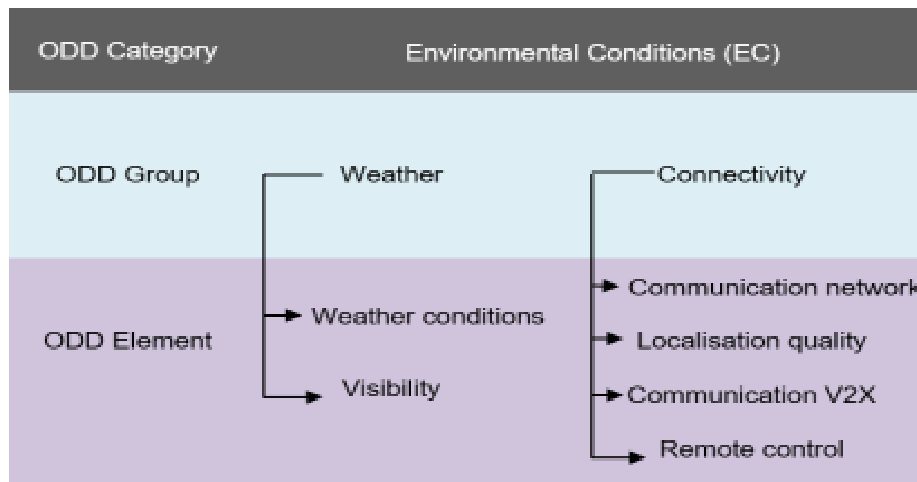
## Operational Design Domain, ODD



ODD groups and elements for Physical Infrastructure category



ODD groups and elements for Operational Constraints category



ODD groups and elements for Environmental Conditions category

Systems/ODD	Physical Infrastructure		Operational constraints				Environmental conditions	
	Roadway	Objects	Traffic	Operational Area	Logistics	Fleet Management	Weather	Connectivity
LOFM	Functional requirement							
ADV								
SI								
SLS								

Principles of how functional requirement relates to AGTS Subsystems and ODD



System	Functional requirement			ODD			
	Aggregated	Context-specific explanation	case	Category	Group	Element	Parameter
ADV	Shall have fallback systems for positioning, detection, etc.	The ADV shall have a fallback system for positioning under ice accumulation to prevent bad detection of edges and road markings	1, 2, 3, 4	Environmental condition	Weather	Weather conditions	Ice accumulation
LOFM	Shall keep track of vehicle position	The LOFM shall keep track of the vehicle position so that it can inform the vehicle about roads that cannot be used for task completion due to ice accumulation	1, 2, 3, 4	Environmental condition	Weather	Weather conditions	Ice accumulation
SI	Shall be able to detect and report real-time position	The SI shall be able to detect and report real-time position information in order to obtain accurate execution of the assignment and support timely delivery	1, 2, 3, 4	Operational constraints	Logistics	Logistics process	Handling of goods - timeliness, positioning
SLS	Shall carry out loading/unloading process	The SLS shall prepare and carry out loading/unloading to ensure timeliness	1, 2, 3, 4	Operational constraints	Logistics	Logistics process	Handling of goods - timeliness, positioning

selection of aggregated functional requirements and context-specific explanations

## ADV: Physical infrastructure

ADV shall be able to detect and provide information about road surface

ADV shall be able to detect and provide information about traffic and obstacles

ADV shall be able to make speed adjustments

ADV shall be able to make positioning adjustments

ADV shall be able to adjust positioning with high precision when (off)loading trailers

## ADV: Operational constraints

ADV shall be able to detect and report real-time position

ADV shall be able to make speed adjustments

ADV shall be able to make positioning adjustments

ADV shall be able to interact with (some) other road users

ADV shall be able to drive in areas with different kinds of restrictions (private/public)

ADV shall always prioritize safety over traffic rule compliance (i.e., stopping in no-stop zone)

## ADV : Environmental conditions

Key electronic components in ADV shall work within operating temperature range

Shall protect electronics/sensors against weather conditions

ADV shall adapt dynamically to all weather and weather induced conditions

ADV tyres shall have adequate traction/friction capability

ADV shall be able to make speed adjustments

ADV shall be able to make positioning adjustments

ADV shall have fallback systems for positioning, detection, etc.

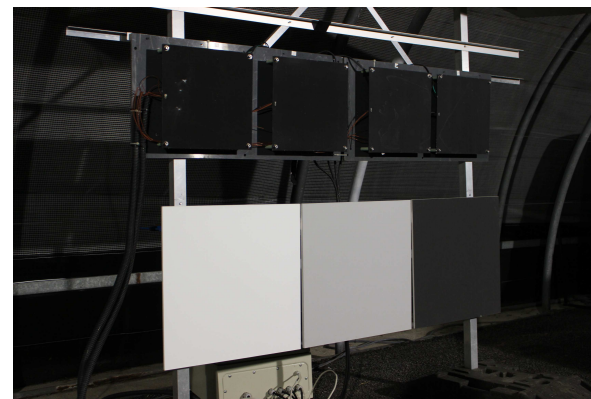
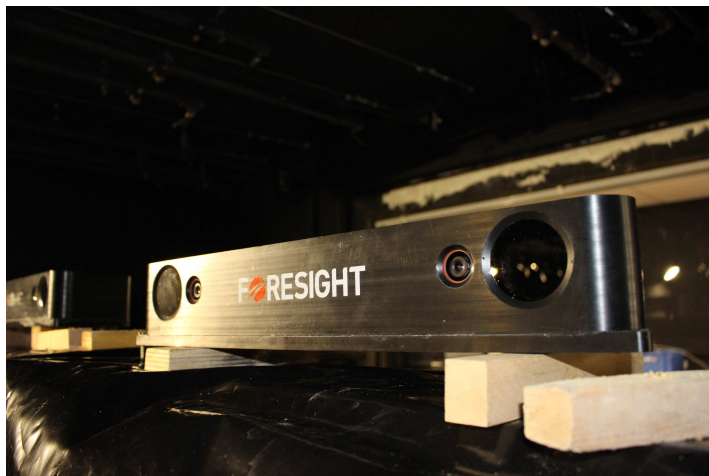
ADV shall have communication capabilities to enable data exchange

ADV shall have communication system capabilities

ADV shall be able to remote control

Quelques actions en cours : WP3 Essais en conditions météorologiques dégradées.

**FORESIGHT**





**MERCI**



[https://twitter.com/award\\_h2020](https://twitter.com/award_h2020)



<https://www.linkedin.com/company/award-h2020>



<https://www.youtube.com/channel/UCOUPgUdn7JIbUYu7MexdzfQ>



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