



The ALFA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 700002.



# ALFA H2020 PROJECT: SafeShore – ALFA common dissemination

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Community Of Users On Secure, Safe And Resilient Societies

4 December 2018, Brussels

Advanced Low Flying Aircrafts Detection and Tracking



**Advanced Low Flying aircrafts  
detection and tracking**

# Contents



- The problem
- ALFA solution
- ALFA concept “how does it work”
- Our upcoming demonstration

# The problem



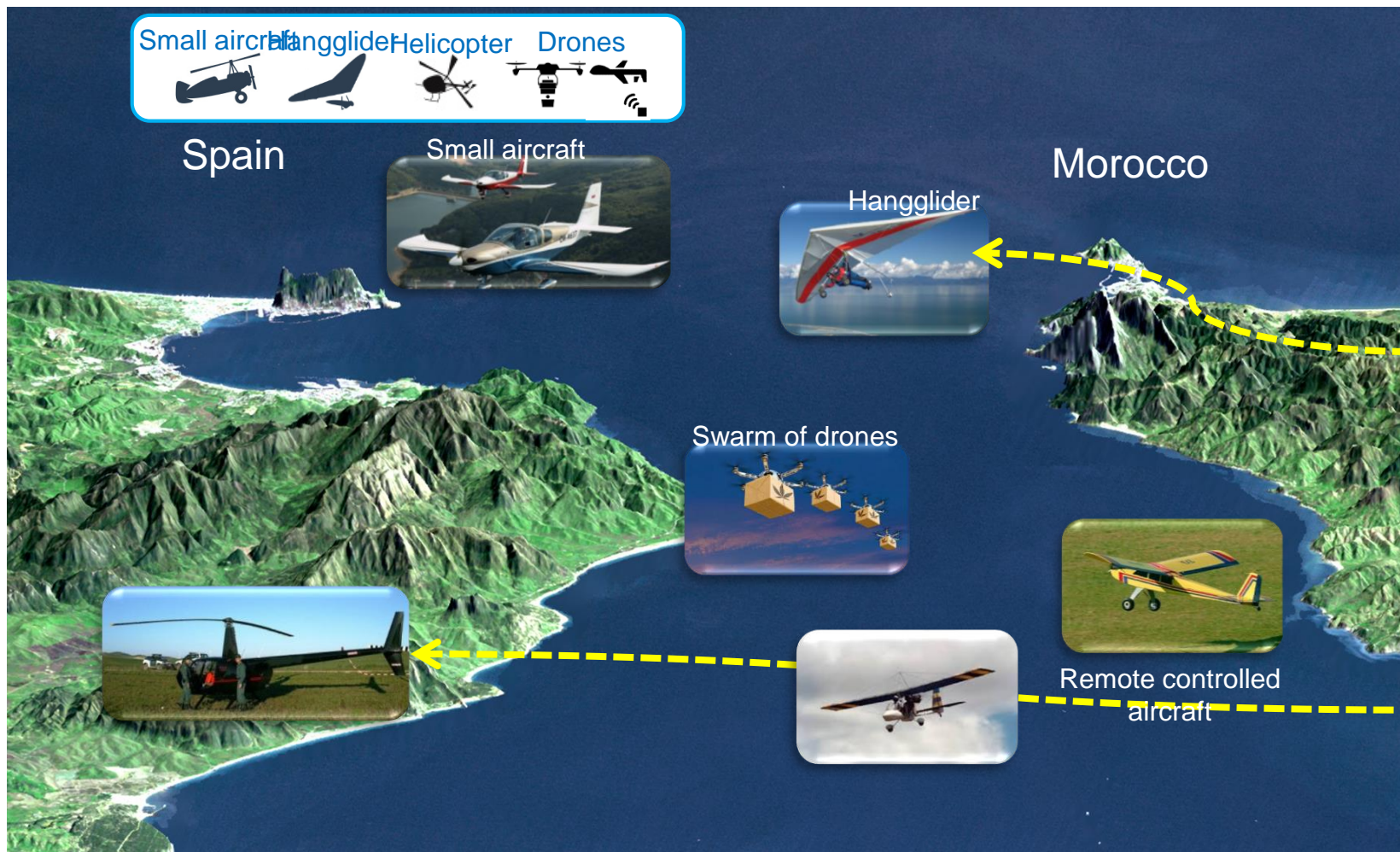
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# GUARDIA CIVIL – MAIN THREAT



# Airborne smuggling



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# The problem

## Three levels in Architecture

- Operational
  - ◆ Already shown
- Functional
  - ◆ Detection of suspicious low flying small aircraft
- Technical
  - ◆ High background clutter
  - ◆ Sensitivity
  - ◆ Radar/optical horizon
  - ◆ Unsuspected flights
  - ◆ Natural objects
    - Birds
    - Fans



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# ALFA Solution - Interoperability

Interoperability

Spain



Guardia Civil  
SIVE

Morocco

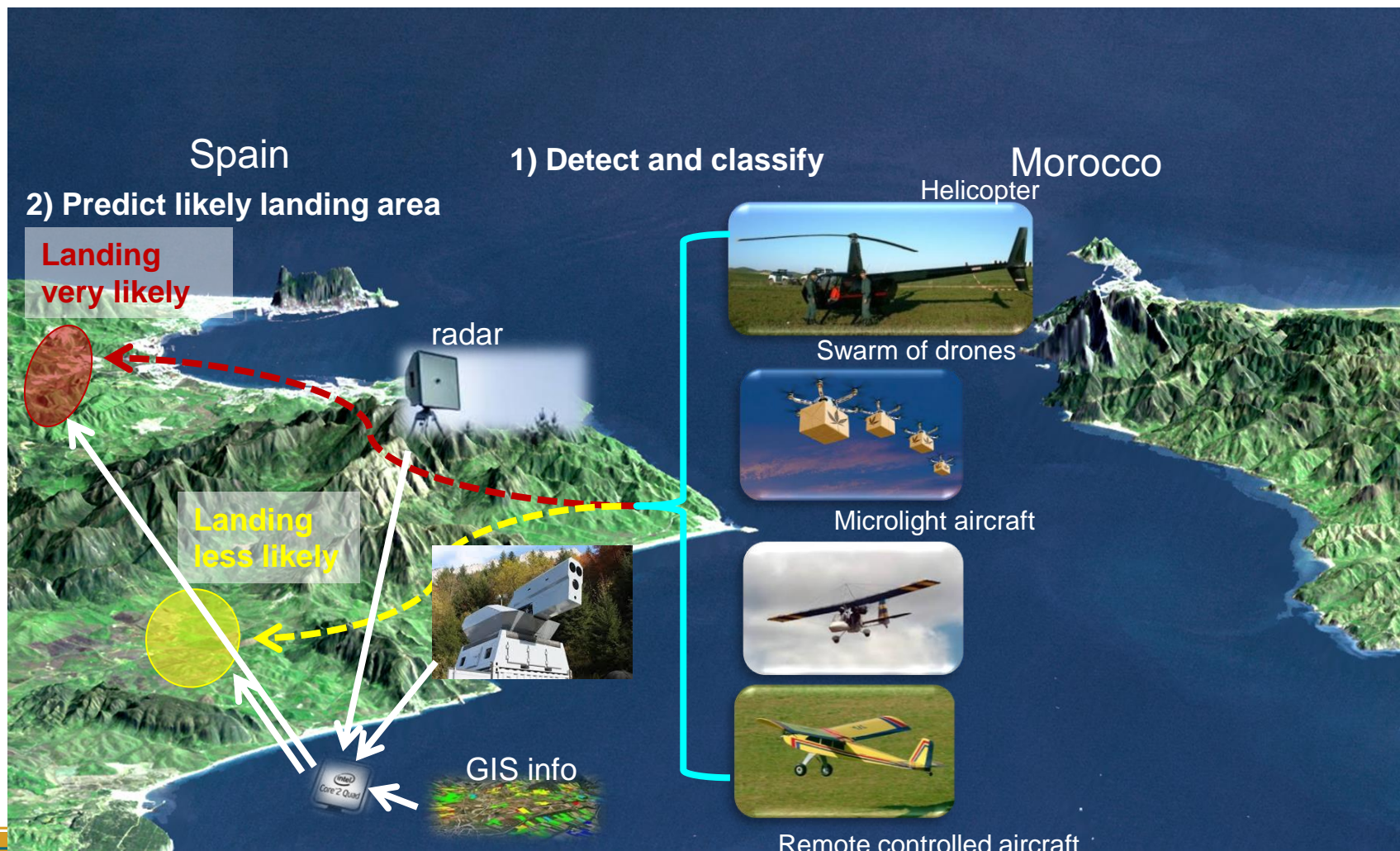


Guardia Nacional Republicana  
SIVICC





# ALFA Solution - Technology



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# Alfa Operational concept



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# Key technologies

- Active radar
- Electro optical sensors
- Radio location / passive RF





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# ALFA Concept

- Fusion
- Analysis
- Landing site prediction
- Cueing and enrichment

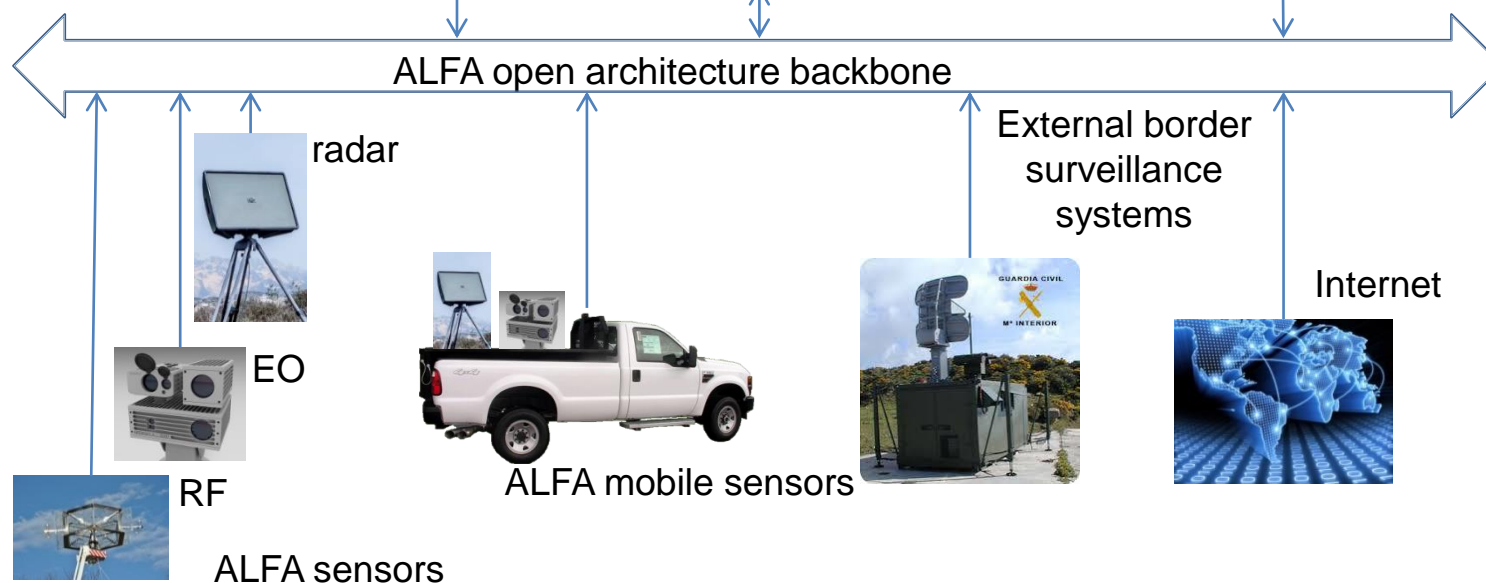
ALFA core



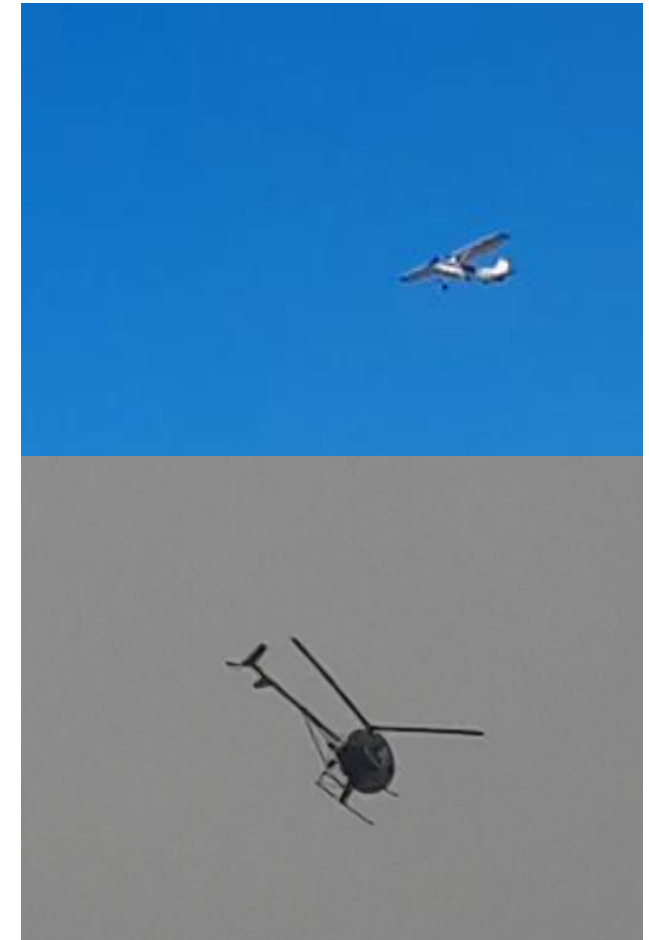
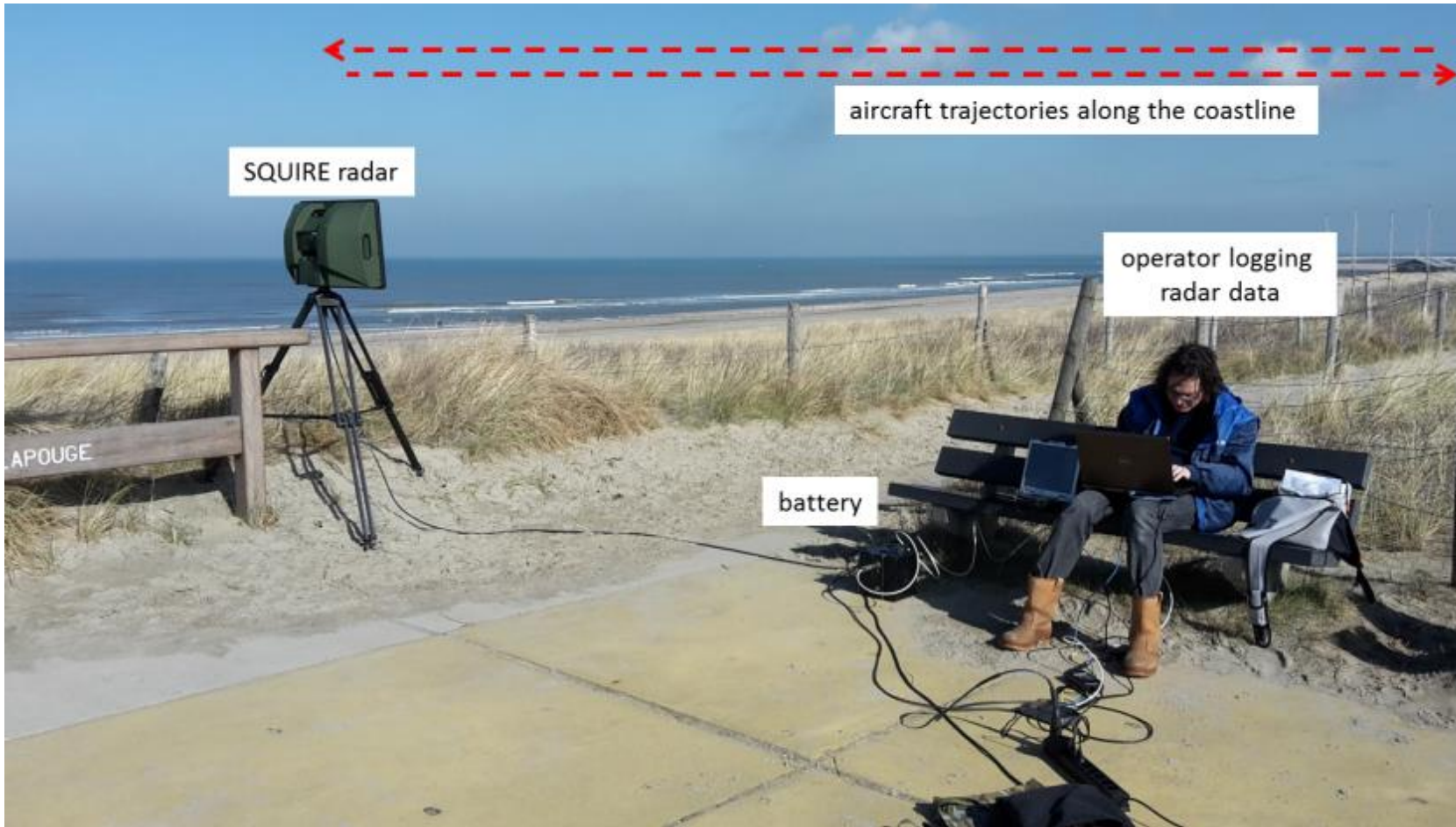
ALFA users



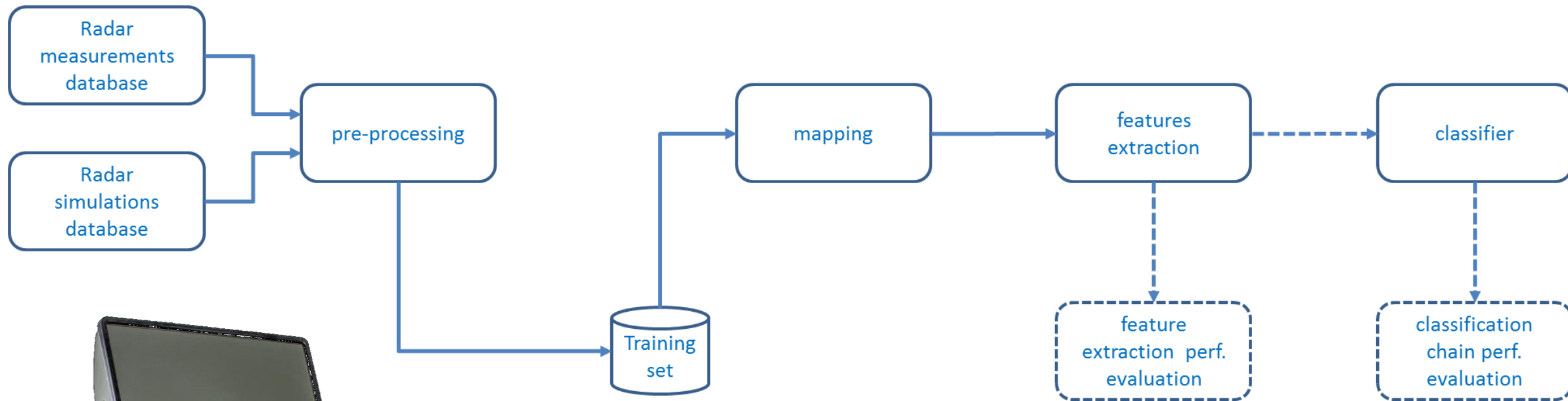
Other users, e.g.



# Sensors - radar



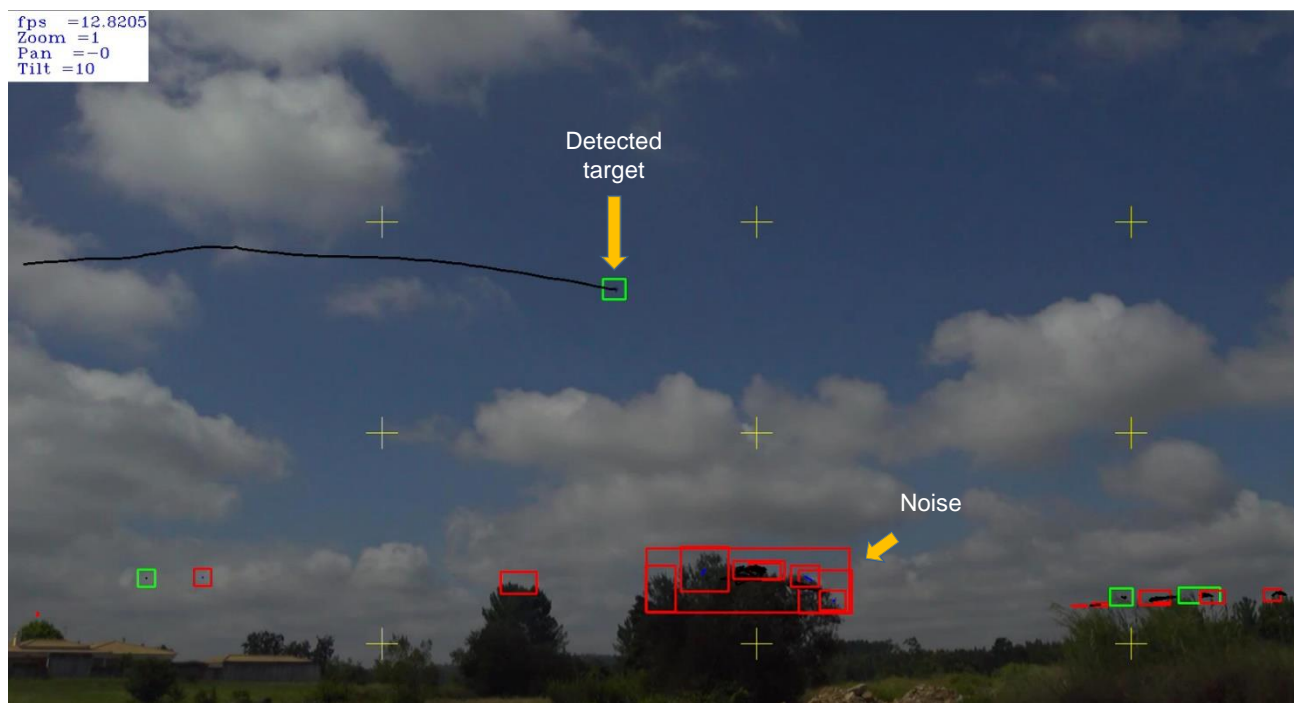
# Radar classifier



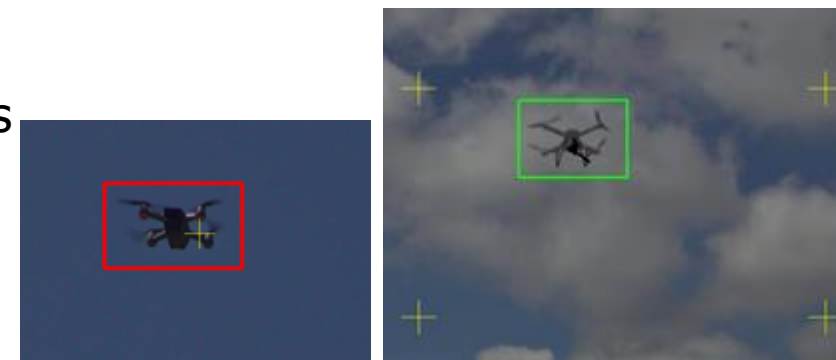


# Electro Optical Sensor field tests

- Testing the detection and tracking phases
- Using real UAVs in order to test
- The performance of the algorithms in filed situations



User interface



Detect and track

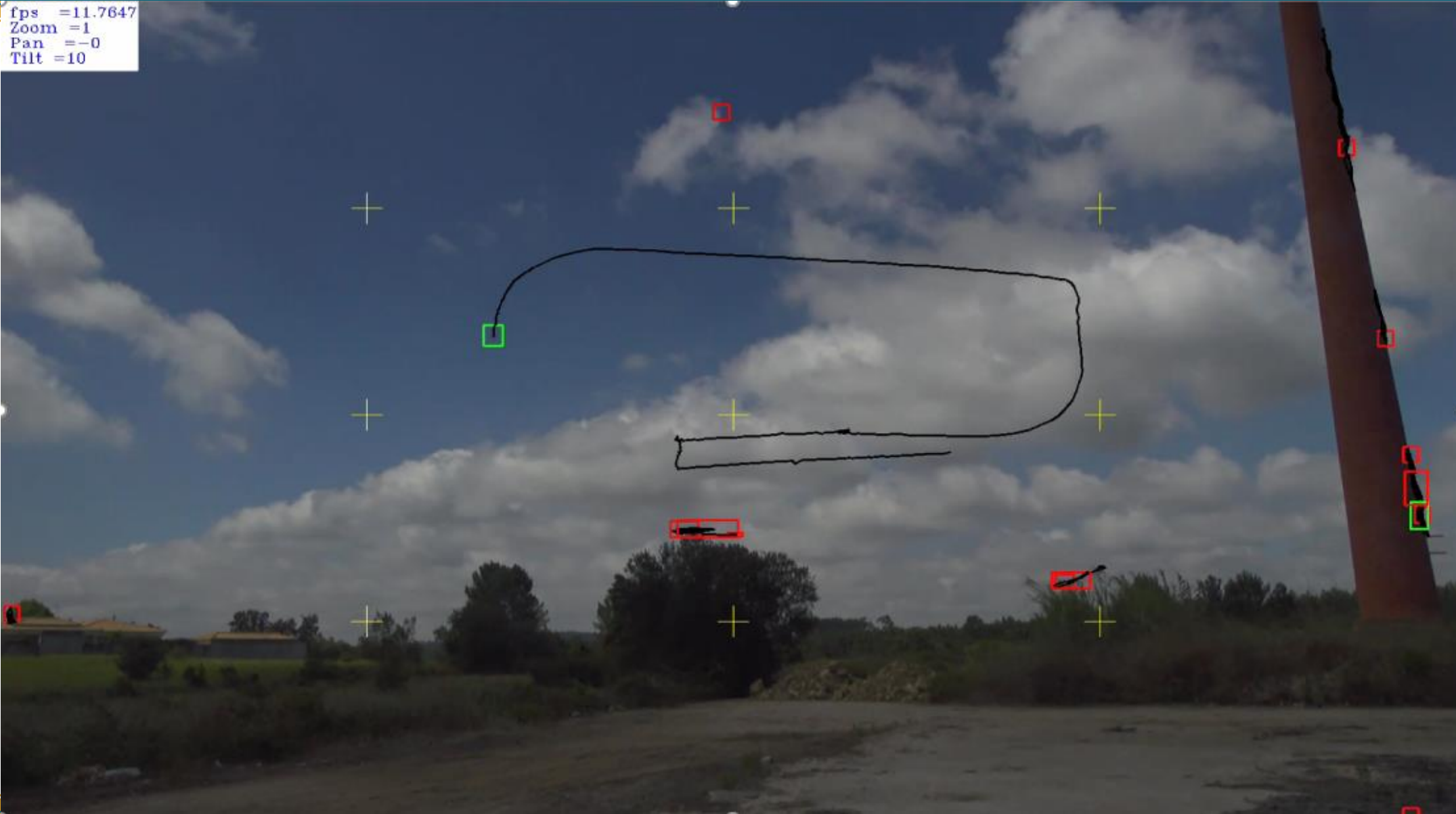
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Zoom =12  
Pan =23.27  
Tilt =17.12



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fps =11.7647  
Zoom =1  
Pan =-0  
Tilt =10

Detect



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fps =13.1579  
Zoom =12  
Pan =8.37  
Tilt =29.77

Tracking



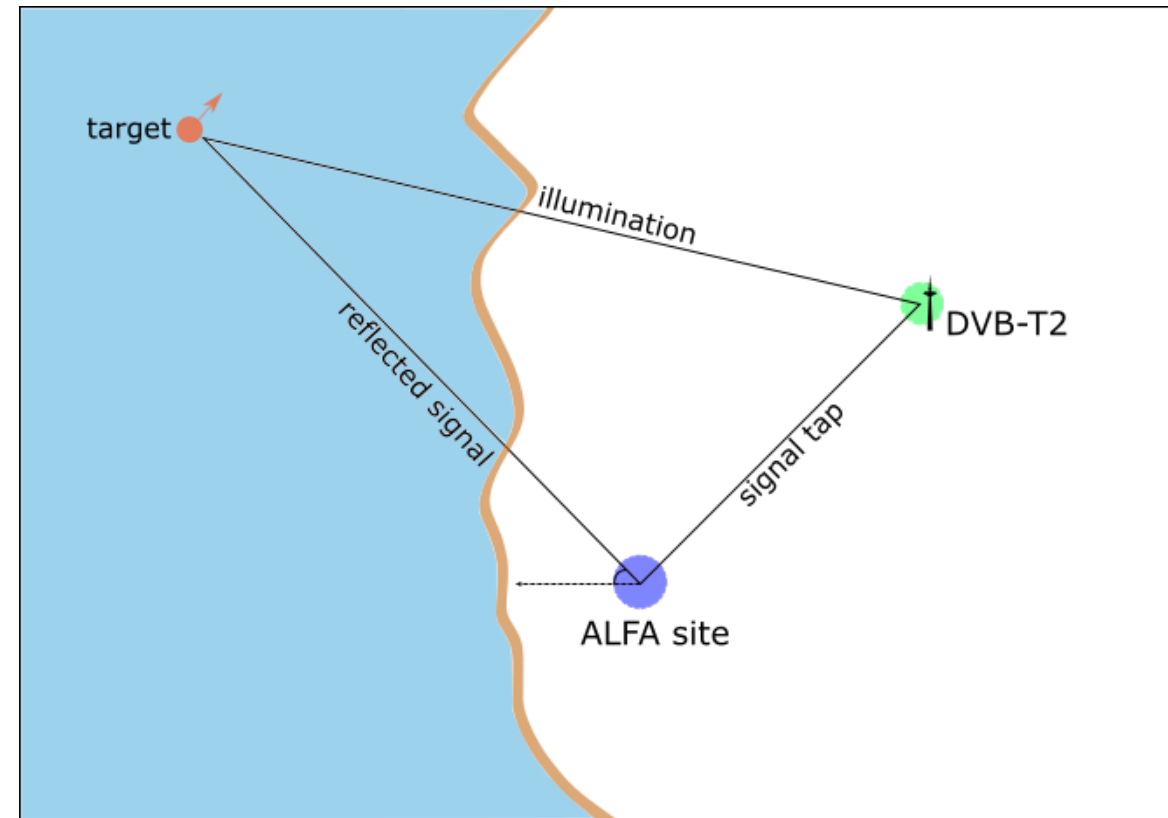
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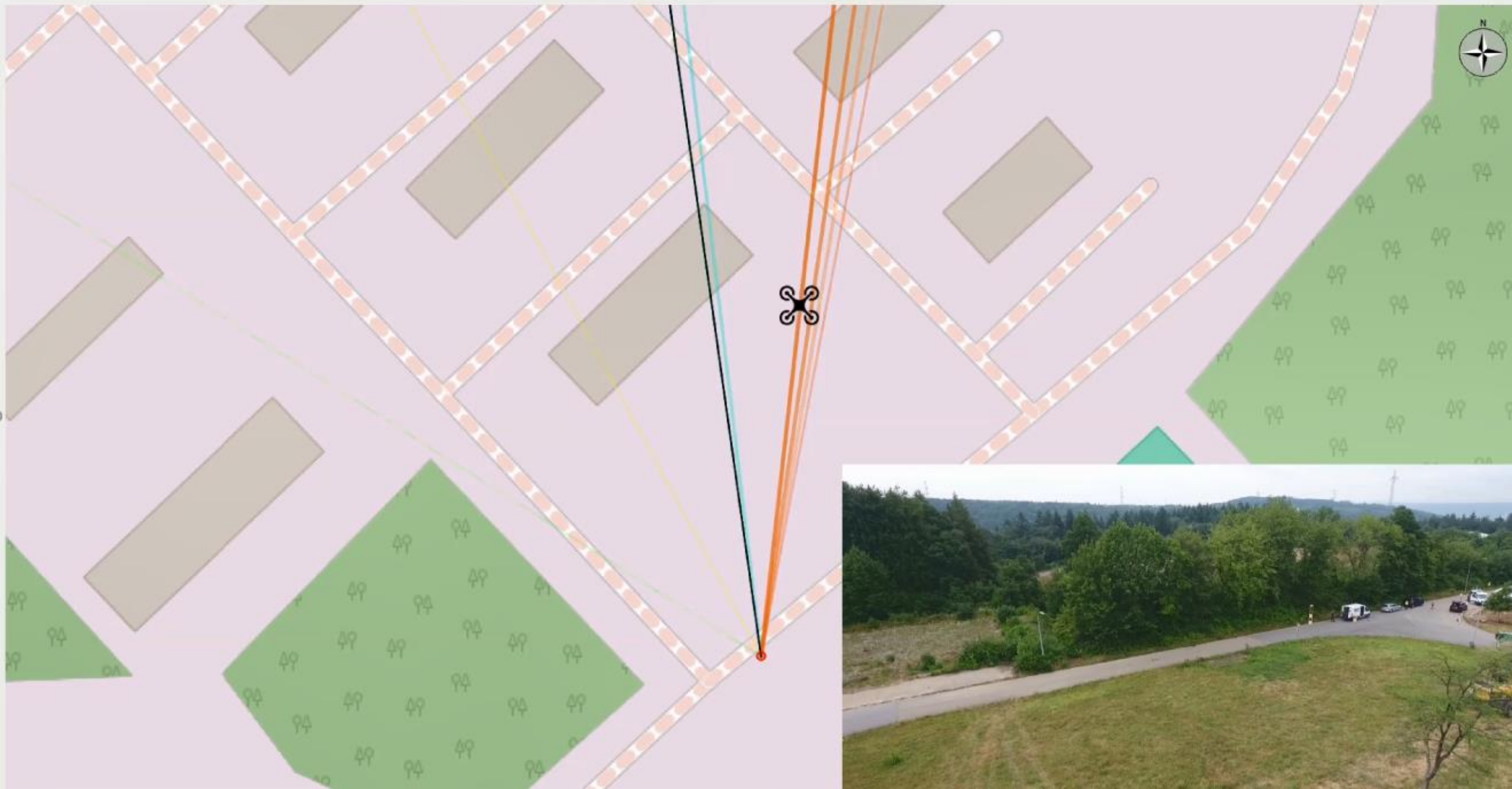


# Passive RF sensor

What is it?

- Detect emissions (LAN, GSM, Control) from the platform (Drone, aircraft)
- Detect reflections on the platform from DVB-T or FM transmissions

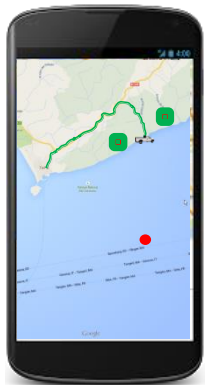




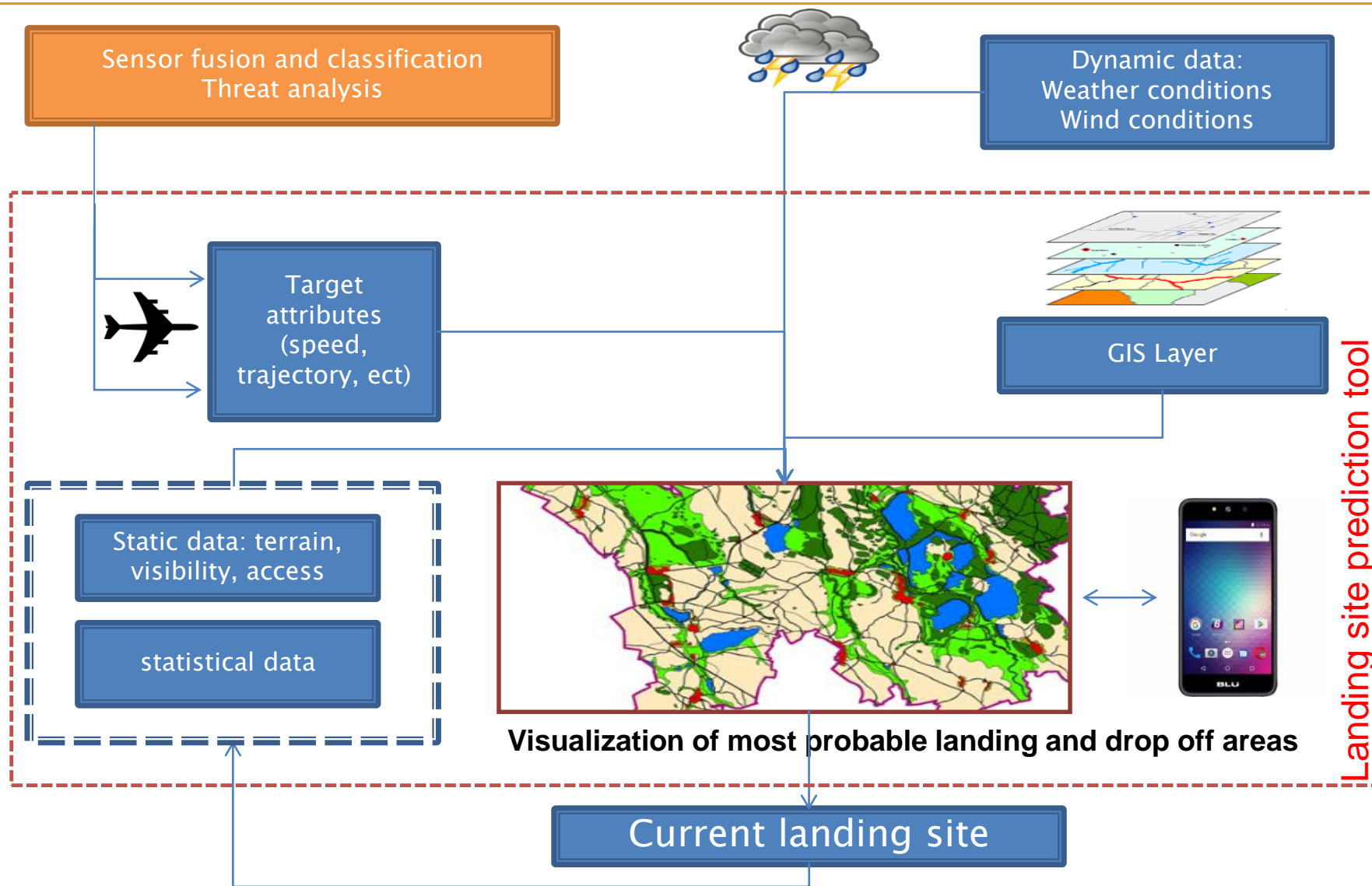
# Processing

Two demo's:

- Threat analysis  
Not shown yet on the ALFA HMI
- HMI



# Landing site prediction tool. Diagram





# Landing prediction (Landing and drop off)

## 1. **Static elements**

- ◆ Terrain is divided in areas
- ◆ Weighed values based on: Access, visibility, terrain, time of the day, lunar cycle, frequency of use, etc.

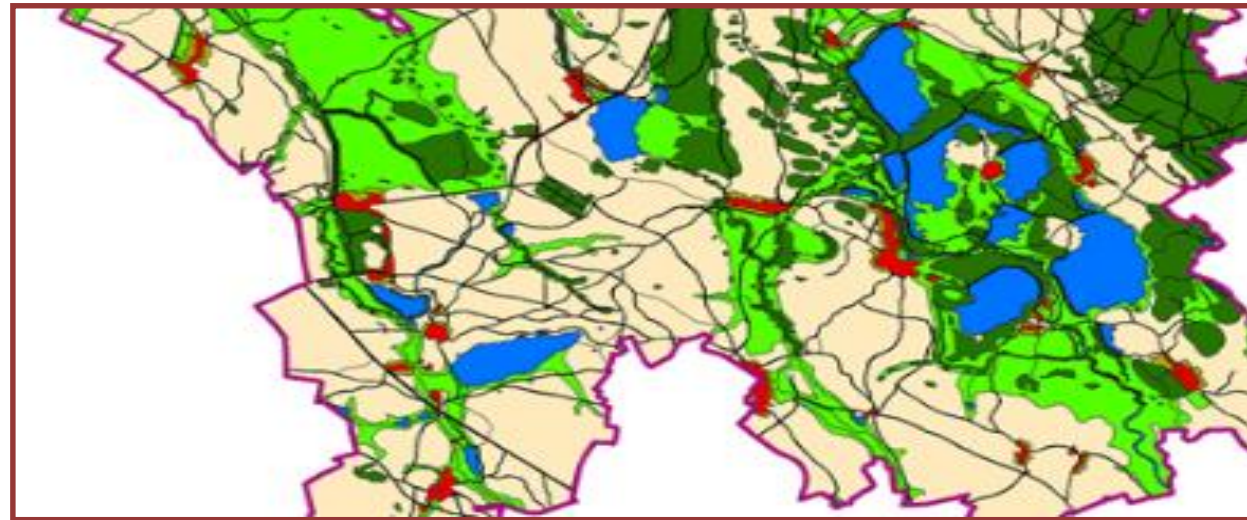
## 2. **Dynamic elements**

- ◆ Extra data (user feedback)
- ◆ Detection data (radar) and possible identification
- ◆ Weather data (specially wind)

# Resulting prediction (I)

In “traditional PC”

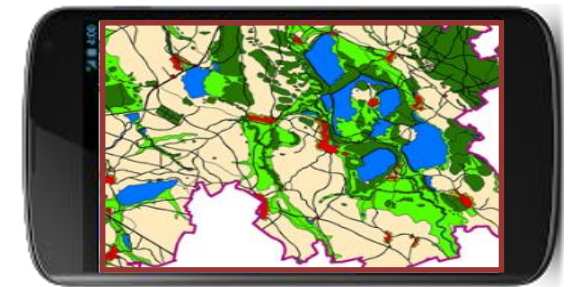
- Final result will be a GIS with probabilities for the different areas with separate predictions for
  - ◆ Landing
  - ◆ Drop off



## Resulting prediction (II)

In smart-phones

- Final result will be a GIS with probabilities for the different areas with separate predictions for
  - ◆ Landing
  - ◆ Drop off
- Additionally there will be:
  - ◆ Distance to the closest (as the crow flies)
  - ◆ Time of landing/drop off



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# Demonstration

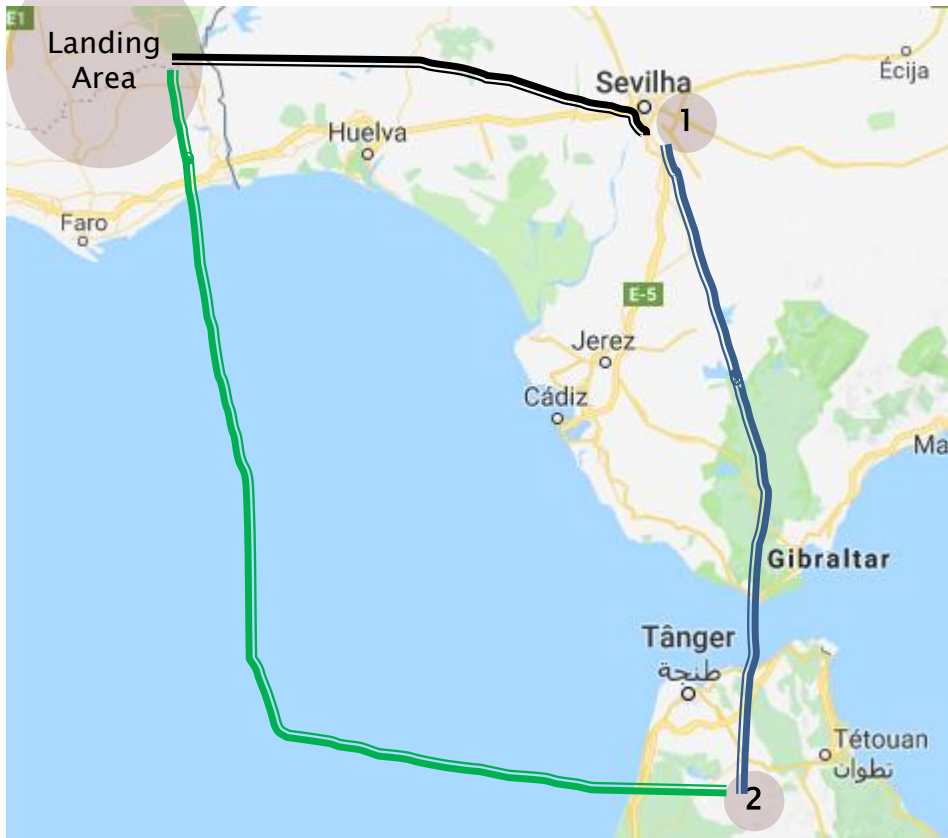
- In the south of Portugal, on the Spanish border
- Early autumn 2019
- Open to end-users and other interested parties
- Keep an eye on the ALFA website <https://alfa-h2020.eu/>

Demonstration at VRSA área  
(Cacela Velha)



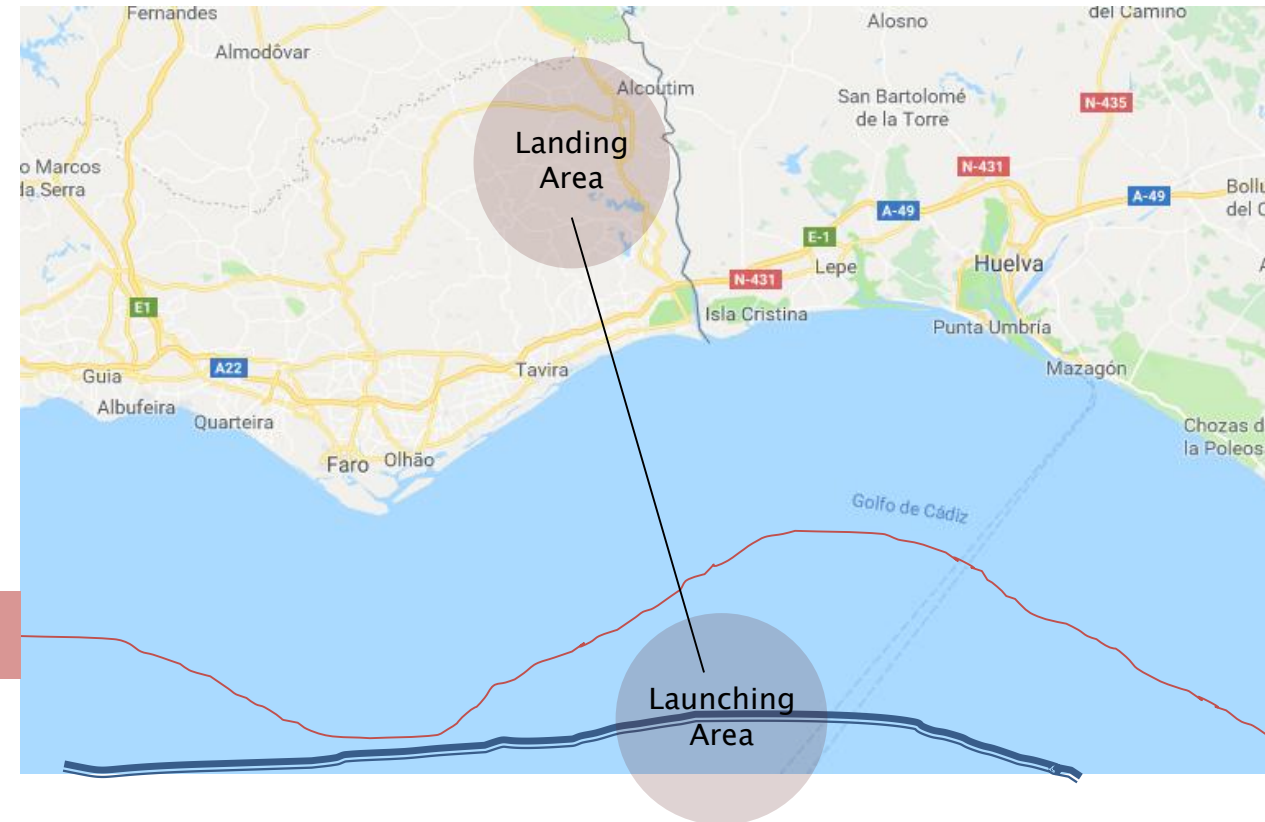
# Demonstration

- Scenario – 1 (Flight route)



12nm

- Scenario – 2 (Drone route)



# Vehicles

- Airplane (light aircraft)



- Small Helicopter (light helicopter)



- Large UAV  
(simulated by a ultra-light aircraft – max. 450Kg)



- Small UAV (30 to 40Kg)



## ALFA Grant Agreement No. 700002

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