



SafeShore “System for detection of Threat Agents in Maritime Border Environment”

[personal data, Art 4(1)(b) of Regulation (EC) No 1049/2001]



Workshop on EU funded border security research projects

FRONTEX, 14 June 2018



Company Overview

UTI Grup is a Romanian based company and a top integrator of Defence and Security Systems for critical infrastructures: Government, Airports and Ports, Energy, Oil & Gas, Defence Units, Emergency Services, Chemical Industry, Nuclear

Excellence in

- Defence and Homeland Security
- IT and Cyber-Security
- eGovernment solutions
- Software engineering & development
- Intelligent Transportation Solutions
- Smart City solutions
- Airport solutions
- Environmental engineering
- Building installations
- Facility and property management

Quick facts

- Established in 1990
- Turnover of 129 mil EUR
- 1800 employees
 - 200 development
 - 600 engineering
 - NATO security clearance
 - Local presence in 5 countries
- Projects in 15 countries
- NATO supplier



ROMSECA – Innovative Clustering Initiatives

Keywords:

Regulatory Frameworks
Public – Private Dialog
Transparency and Market Fairness
Standardization and Certification
National Industry Development
Export Promotion
EU and Euro-Atlantic Partnerships
Regional Cooperation
Technology & Capabilities Development
Education and Research and Innovation
Smart Specialization

Open Platform Clustering Initiative

Federation of Associations in the Romanian Security and Defence Industry



Contribution to projects promoted by Patromil – RO NDIA

Romanian Participation in EU/EDA capabilities

Combat Equipment for Dismounted Soldier

Development of a modular platform for combat dismounted soldier

UTI Grup, IOR S.A, INTERACTIVE S.A. PROOPTICA S.A & METRA (MoD) participates in kind (Observation Under Reduced Visibility)



Maritime Mines Counter Measures

Identifying technological solutions for surveying and protecting the coastal areas

Countermeasures for improvised explosives devices (C-IED)

Prediction, prevention, detection, neutralization, reducing the effects of IED actions through recording and analyzing the relevant information

European Transportation Air Fleet

Acquisition and utilization, in common, of aircraft and making it available to the partners of airport infrastructure

European Satellite Communication (SATCOM) Procurement Cell



Contribution to projects promoted by Patromil – RO NDIA

Romanian Participation to NATO capabilities



AGS

Getting informative superiority through allocation, integration and operating systems of sensors, UAVs, launchers and ground systems

Early Warning and Control of NATO Airborne Force

Airborne multinational capability for air surveillance, early warning and command and weapon control

The NATO Air Command and Control System

Radar integrated system, data centers and adequate software for planning and conducting air missions

Ballistic Missile Defence System – BMD

Short and medium range ballistic missiles through the integration of sensors and interception systems

Dismounted C&I Module



Romanian Security Research Success Stories

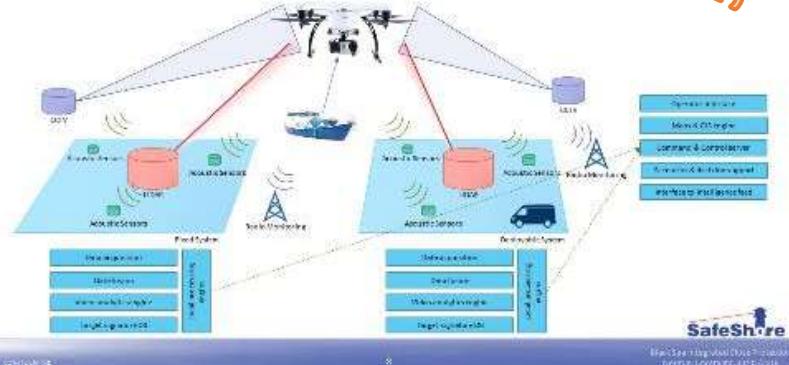


System for detection of Threat Agents in Maritime Border Environment

PhD. eng. Răzvan ROMAN
The Protection and Guard Service



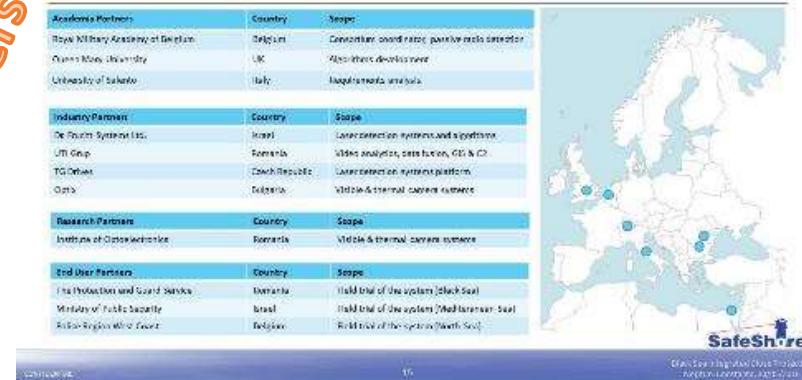
System Diagram



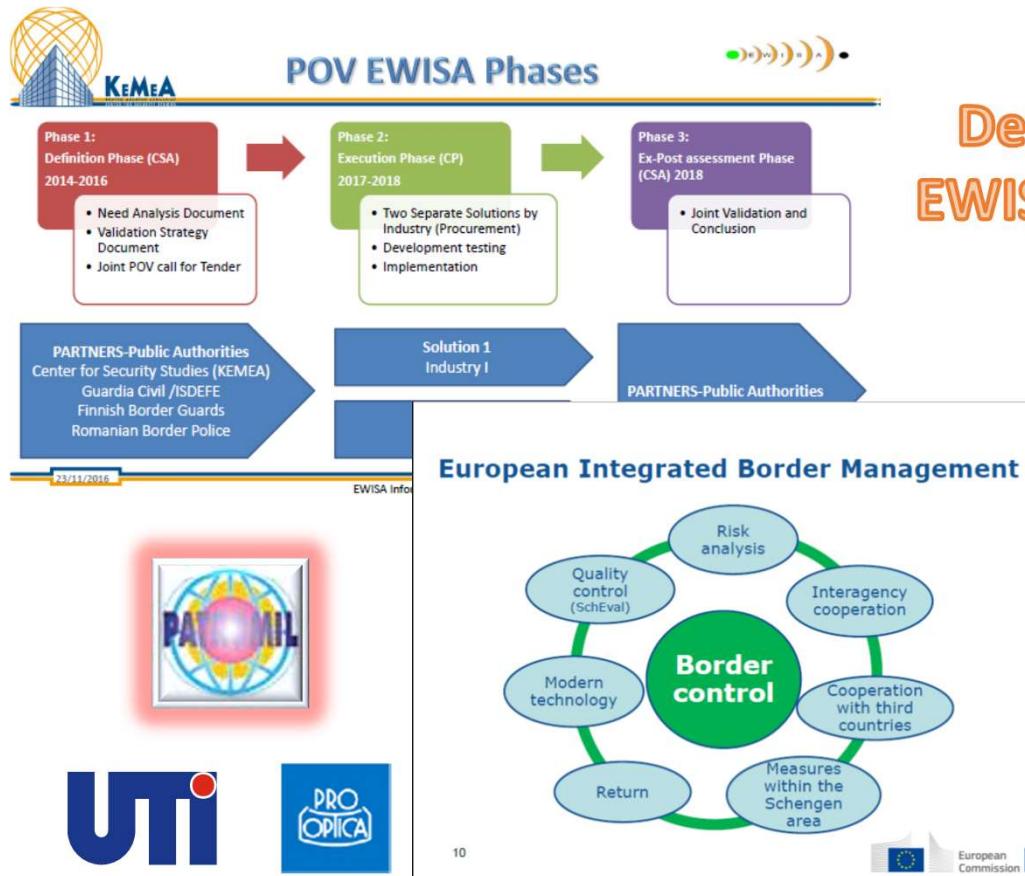
5 M Eur H2020 Project
30% for RO Partners

Partners

Academic Partners	Country	Scope
Royal Military Academy of Belgium	Belgium	Conceptual coordination, passive media detection
Queen Mary University	UK	Algorithm development
University of Salento	Italy	Requirements analysis
Industry Partners	Country	Scope
De Puyan Systems Inc.	Israel	Layer connection systems and algorithms
UTI Grop	Romania	Video analysis, detection, GIS & CI
TG Optics	Czech Republic	Layer connection systems platform
Ostis	Belgium	Video & thermal camera cameras
Research Partners	Country	Scope
Institute of Geophysics	Romania	Middle & thermal cameras source
End User Partners	Country	Scope
The Protection and Guard Service	Romania	Field trial of the system (Black Sea)
Ministry of Public Security	Israel	Field trial of the system (Mediterranean Sea)
Alstom-Railways SA	Belgium	Field trial of the system (North Sea)



Romanian Security Research Success Stories



Development and testing services for
EWISA FP7 Project - 40% for RO Partners



Romanian Security Research Success Stories



SWARM UAV – MAI
SPIA-VA – SPP
SPERO – ROSA

- 3 top-down National R&D projects coordinated by RO public authorities: MAI – Ministry of Internal Affairs, SPP – Presidency and Government Security Guarding and Protection Service; ROSA – Romanian Space Agency.
- Objective: creating advanced prototype solutions (TRL 8) for systems to be used in National Security Applications

UTI Workshare > 1,5 M Eur
R&D Cofinancing > 50%

SafeShore

UTi Security and Defence R&D Initiatives

Defence & Dual Use + Cyber + RPAS

Support for Cybersecurity Events



High Level Meeting
Cybersecurity in Civil Aviation

25
plus one



BSC
BUCHAREST SECURITY CONFERENCE

Palace of the National Military Circle
1 Constantin Mile Street
11-12 November 2016

Bu
Pe



„Bucharest Security Conference.
A changing security environment: new threats, new solutions”

CYRA Secure RPAS Project Proposal



Horizon 2020

Pillar: Societal Challenges

Work Programme Year: H2020-JTI-SESAR-2016

Work Programme Part: SESAR Work Plan 2016

TOPIC : Security & cyber-resilience

Topic identifier: RPAS-06
Publication date: 28 June 2016

Types of action:
DeadlineModel:
Opening date:

Deadline: 15 November 2016 17:00:00

Time Zone : (Brussels time)

**Cyber – resilient System Architecture
based on the model of
the EU TACHOnet telematics network
for the future RPAS UTM System Security**

Support for EDA PA on CSDP Research



Fact sheet

www.eda.europa.eu

Preparatory Action (PA)
on CSDP-related research



Laying the groundwork for
tomorrow's defence capabilities

Step by step: from a Pilot Project
to the Preparatory Action

SafeShore

UTi Security & Defence Industrial Cooperation

OUR TARGETS ANDS CAPABILITIES:

Cooperative programs in the field of:

- Homeland Security
- Public Security
- Border Security
- Defence



based on R&D, for developing & upgrading :

- Wide area ISR solutions
- C4ISR, JISR
- Cybersecurity and Cyberdefense
- Signal processing and videoanalytics
- RPAS/UAV and other UVS Solutions
- Air Defence Systems
- Air, Land and Naval Forces Platforms



Safeshore Project Consortium

Academia Partners	Country	Scope
Royal Military Academy of Belgium	Belgium	Consortium coordinator, passive radio detection
Queen Mary University	UK	Algorithms development
University of Salento	Italy	Requirements analysis

Industry Partners	Country	Scope
Dr. Frucht Systems Ltd.	Israel	Laser detection systems and algorithms
UTI Grup	Romania	Video analytics, data fusion, GIS & C2
TG Drives	Czech Republic	Laser detection systems platform
Optix	Bulgaria	Visible & thermal camera systems

Research Partners	Country	Scope
Institute of Optoelectronics	Romania	Visible & thermal camera systems

End User Partners	Country	Scope
The Protection and Guard Service	Romania	Field trial of the system (Black Sea)
Romanian Border Police	Romania	Field trial of the system (Black Sea)
Ministry of Public Security	Israel	Field trial of the system (Mediterranean Sea)
Police Region West Coast	Belgium	Field trial of the system (North Sea)



Safeshore team: What we do and how it started



Brussels Royal Military Academy

Consortium Coordinator Story

- Addressing a global emerging threat
- H2020 BES-02-2015 challenge
- Proposed solution
- Project idea
- SEREN support



Legitimate use of UAVs

- Commercial drones and UAVs are an affordable technology that started to be used in pilot projects for delivery of goods.
- Such a pilot project has been run by Amazon for parcel deliveries since 2014, under the name “**Amazon Prime Air**”.
- UAVs have been used in proof-of-concept projects to **deliver first-aid equipment** in case of emergencies (run by TU Delft University in Netherlands).



Legitimate use of UAVs

Many legitimate use cases:

- Mapping
- Police
- SAR
- Movies & Films
- Hobby
- Delivery
- Inspection
- ...



Use of UAVs increases

According to the FAA UAS Sightings Report*:

- 76 sightings per month in 2015 (764 drone sightings over Nov 2014 – Aug 2015)
- 211 sightings per month in 2017 (634 drone sightings over July 2017 – Sept 2017) – almost 3 times more!

Thomas Frey – US futurist**:

- Predicts that there will be 1 billion drones in use by 2030 (not only flying!)
- Lists 192 uses of drones***

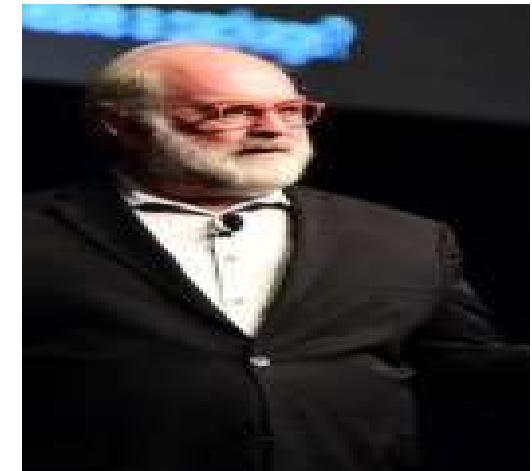


Photo: ABC News

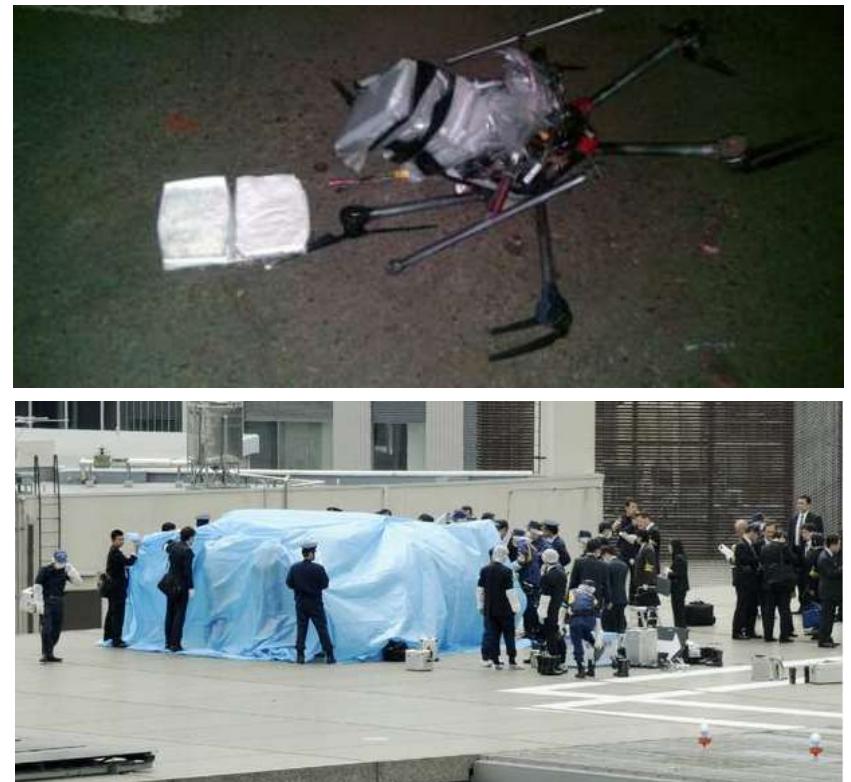
*https://www.faa.gov/uas/resources/uas_sightings_report/

** <http://www.abc.net.au/news/2017-08-31/world-of-drones-congress-brisbane-futurist-thomas-frey/8859008>

*** <https://www.futuristspeaker.com/business-trends/192-future-uses-for-flying-drones/>

The Problem – Illegal use of UAVs

- UAVs can be used for smuggling items over borders or in restricted areas, in order to avoid detection of illegal items or to avoid taxing.
- Such a UAV has been found crashed in Tijuana while carrying **high risk drugs** (**Mexico**, 20 January 2015).
- In another incident, a drone was used to deliver a container with **radioactive material** on the roof of the **Japan's Prime Minister's residence** (9 April 2015).



The Problem – Illegal use of UAVs

- Despite drones being banned in France, 56 cases of drones **illegal surveillance of nuclear power plants** since October 2014
- France has started a 1 million EUR program to develop drone detection solutions.
- Drones were used in a public event during the **Angela Merkel** election campaign in 2013.



The Problem – Illegal use of UAVs

- Criminals use drone to **deliver drugs** straight to prisoner's cell window in unique smuggling bid (Manchester 22 April 2016)
- The same event has been caught on CCTV in Wandsworth Prison, London
- Drones are being used as **tactical intelligence gathering platform by organized crime**, in order to plan and coordinate border traffic



The Problem – Illegal use of UAVs

Terrorism:

- IS using drones domestically to spy on ‘enemy’ troops / force protection
- Hamas using drones against Israel



Activism

- Drone with Palestinian flag apprehended in Brussels before Belgium-Israel football game.



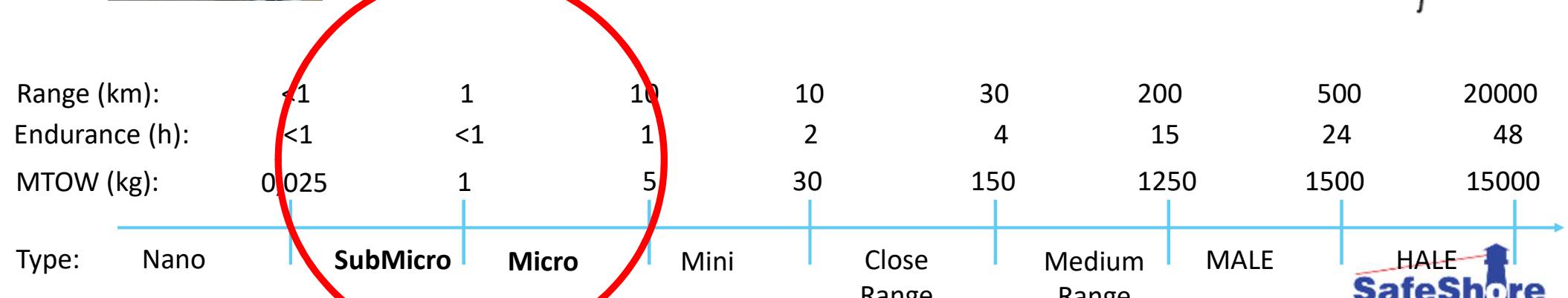
The Problem – Migrants

- With the crisis in the Middle East and Africa, 1000s of migrants arrived on the European shores in **rubber dinghies which are not detected by conventional radar systems.**
- Refugees rescued trying to get to UK in inflatable dinghy (Dunkirk 1 April 2016)



Types of UAVs

- Security risks are mostly a concern for the submicro and micro categories
- Moreover, it can be expected that costs for these systems will go further down in the coming years

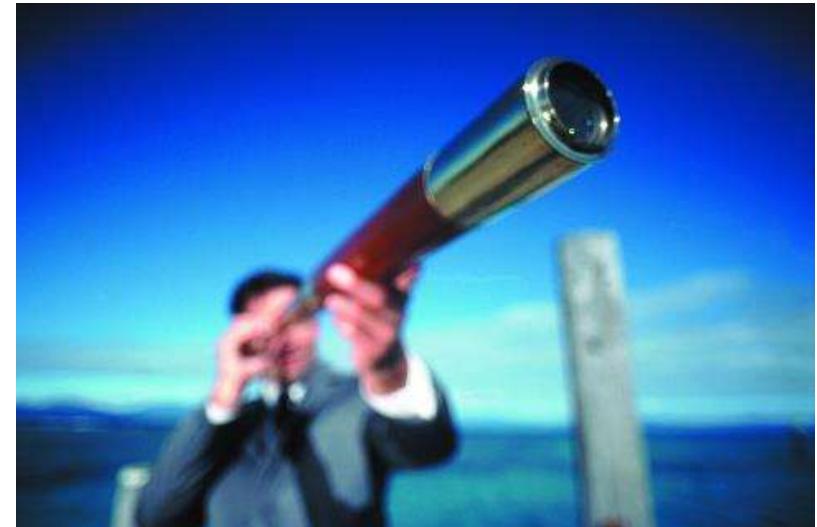


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Detection Modality 1 - Vision

- Camera monitors the sky and tries to detect drones

- 👎 Limited Range = limited interception time
- 👎 Difficult to deploy in cluttered environment (e.g. urban)
- 👎 Difficult to filter out birds / sun reflections
- 👎 Does not work at night



- 👍 Can be used as a supporting sensing modality, but not as a main sensor



Detection Modality 2 - Infrared

- Infrared camera monitors the sky and tries to detect drones
 - 👎 Limited Range = limited interception time
 - 👎 Difficult to deploy in cluttered environment (e.g. urban)
 - 👎 Difficult to filter out birds / sun reflections



- 👍 Better detection capability than visual
- 👍 Works day and night
- 👍 Can be used as supporting sensing modality, but not as main sensor

Detection Modality 3 - Acoustic

Two possibilities:

- Try to detect propeller noise in audible spectrum
- Try to detect motor PWM frequency in ultrasound spectrum

- 👎 Very Limited Range = limited interception time
- 👎 Difficult to deploy in noisy environment (e.g. urban)

- 👍 Better detection capability than optical

- Example: Droneshield (UK)



Detection Modality 4 - Radar

- Classical Radar (radio-wave detection) used also to detect aircraft

- 👎 Very high cost
- 👎 Limited Range = limited interception time
- 👎 Difficult to filter out birds: many false positives

- 👍 Range
- 👍 Multiple targets
- 👍 All-weather

- Examples: Squire (Thales), Aveillant (UK), RobinRadar (NL)



Detection Modality 5 - Lidar

- Uses laser to search the sky for drones

👎 Experimental

👎 Range limited by laser power

👍 Very Precise detection

👍 Very Precise localisation

👍 Multiple targets

👍 All-weather

- Example: DFSL, Avigail



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Detection Modality 6 – Radio Communication

- Scan radio frequency spectrum to detect remote control commands

👎 Depends on remote operation, fails for autonomous operations.

👎 Localisation often very imprecise

👍 Range

👍 Multiple targets

👍 All-weather

- Example: DroneDetector



Detection Modality Combinations

Radar + Optical:

- Blighter AUDS (UK)
- Falcon Shield (It)
- ARTsys360 (Il)
- Airbus (Fr)
- Drone Guard (Il)
- Boreades



Radio + Optical:

- Gryphon (USA)



Acoustic + Optical:

- DeDrone

Radar + acoustic + optical:

- ICARUS
- Lockheed Martin



Detection Modality Combinations

Radio + Lidar + Acoustic + Optical:



H2020 Call BES-02-2015 Maritime Border Security

Topic 2: Affordable and easily deployable technologies for EU coastal border surveillance with reduced impact on the environment

Specific challenge

- The use of **low cost and “green” technologies** is expected to become mandatory for future border control systems in environmentally sensitive areas. Passive systems fit this application, due to electromagnetic invisibility, **lower detectability** and cost and the possibility of use practically anywhere.

Scope

- further development of **devices and sensors for maritime targets and environment** (e.g. fit for mobile platforms) easily deployable on field and with **limited impact on spectrum environment**.
- development of specific, early identification, **tracking and fusion** algorithms
- operation in **network configurations** together with other systems for improved performances

Project started on 01 May 2016

Project ends on 31 October 2018



SafeShore proposed solution

Mission

- Detection of **low altitude drones** and their **remote control equipment** involved in unauthorized surveillance and offensive actions (delivery of explosive charges or small projectile attacks), launched from boats, ships or land, in border area harbours, in coast radar locations, at river border crossings and on-board oil platforms and large ships.
- Detection of **small vessels coming to shore**
- Detection of **humans emerging from the sea**



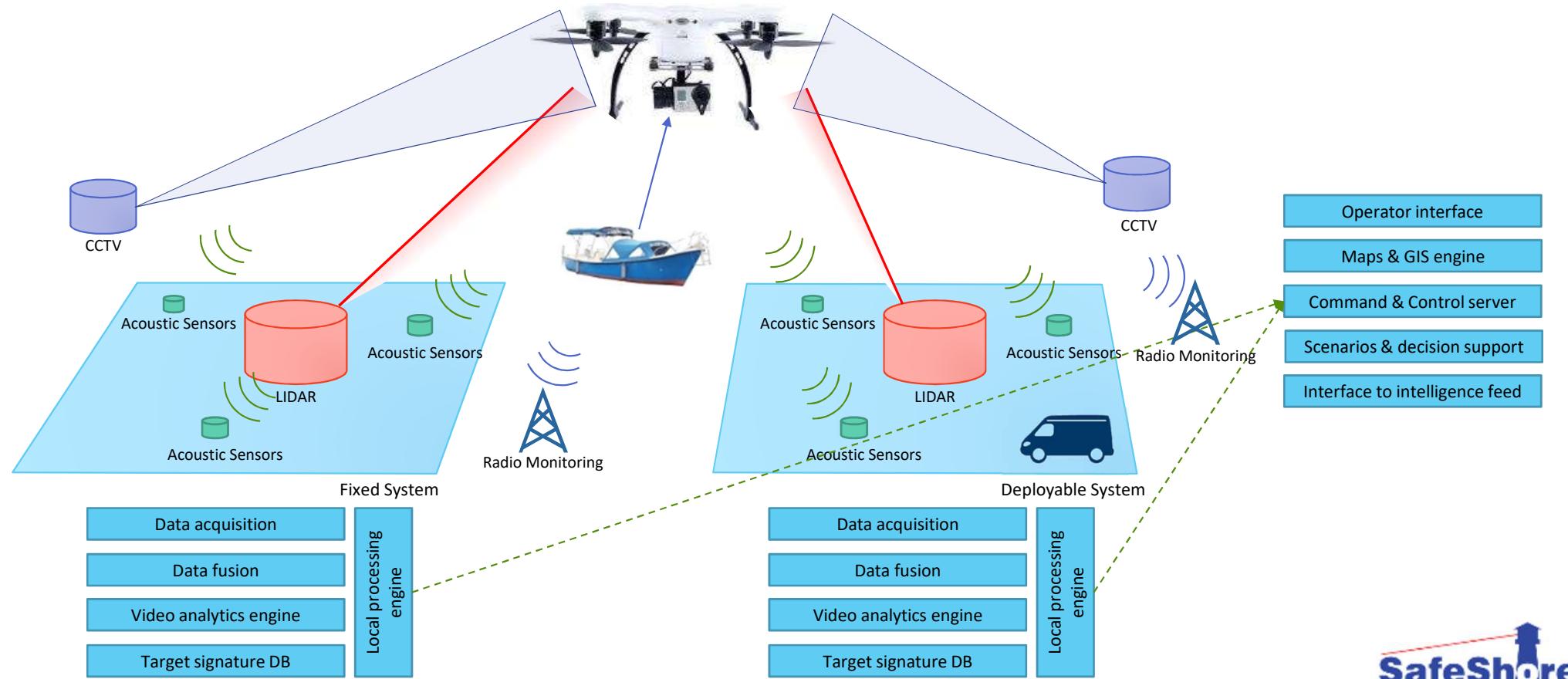
Technology

SafeShore will develop a system integrating multiple commercially available detection technologies to ensure detection of low-altitude flying drones and small boats

- **Laser ranging (LIDAR) detection** of small drones at low altitude, where radars cannot ensure detection due to altitude radar limitation and small radar cross section of the target
- **Passive acoustic detection**, to offer a complementary detection technology that is not affected by the same adverse effects as the laser scanner, and to provide means for acoustic target classification
- **Visible and thermal CCTV target classification**, to provide means of verifying the detection and classifying the target based on its aspect; classification result will be combined with the acoustic target classification result
- **Passive radio communication detection and localization** of remote control stations on sea or land, by passive spectrum monitoring and triangulation



System Diagram



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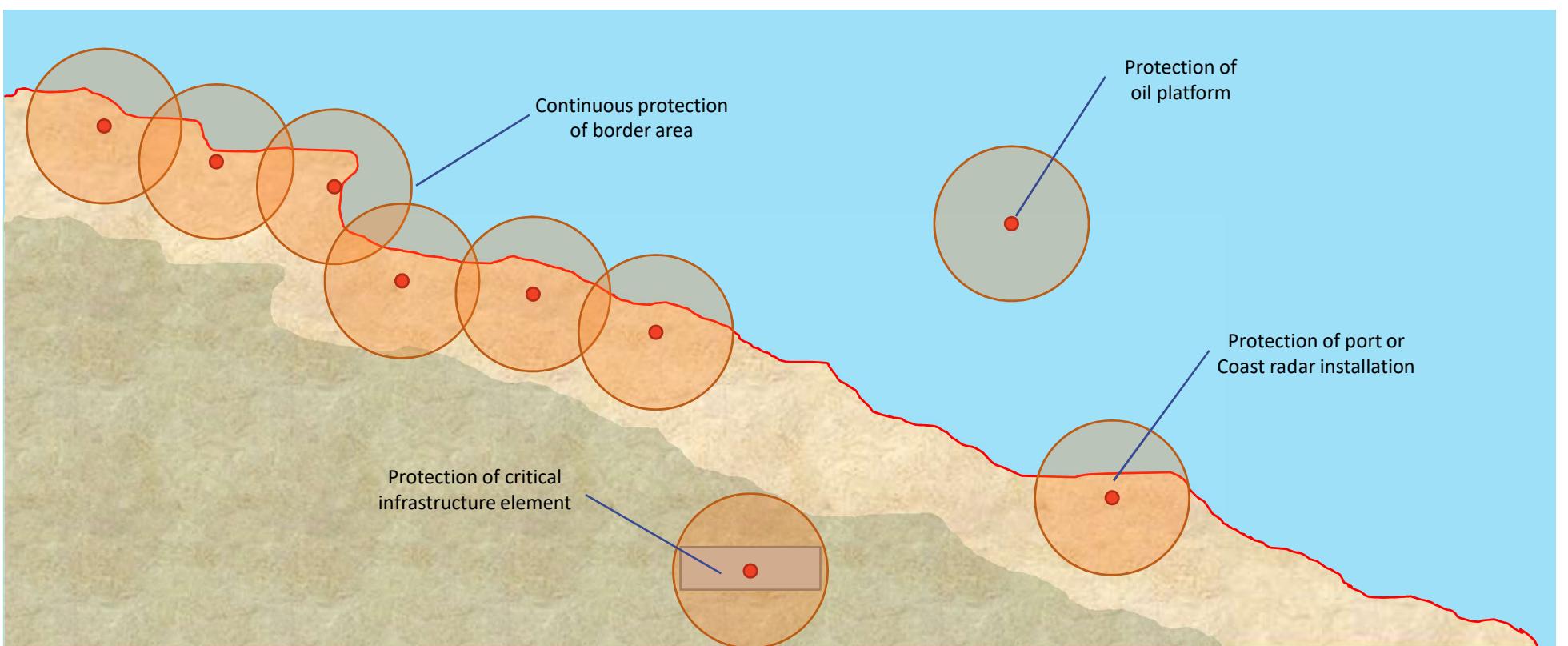
SafeShore Configurations

The SafeShore system can be used as:

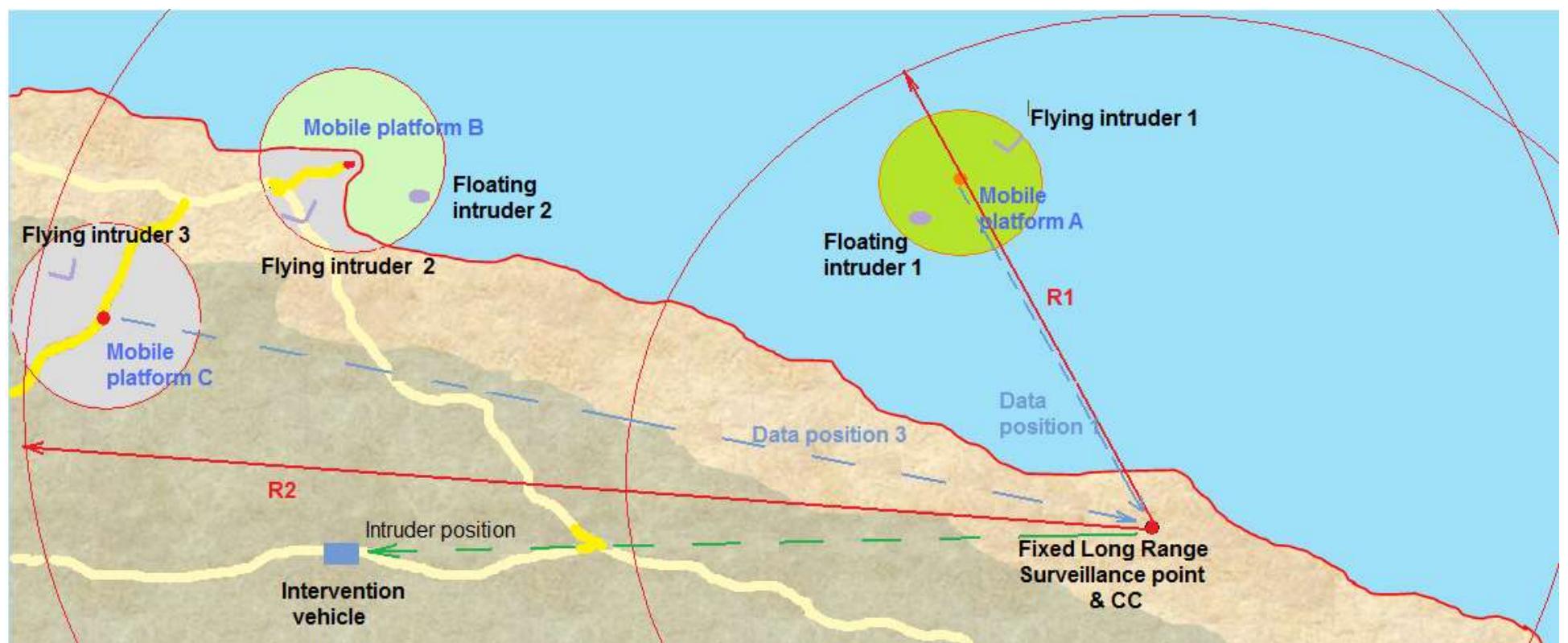
- **stationary detection point**
 - in harbour areas, at river border crossing, to detect remote delivery of explosives or chemical weapons, and border trafficking of drugs
 - for coast radars, to detect remote delivery of explosive charges
- **stationary chain-of-detectors** along high-risk border areas, to provide long term protection in areas with persistent problems
- **mobile deployable system** in areas where intelligence predicts higher volume of illegal or threatening activities.



Sample Deployment of Detection Systems



Detection, Assessment, Tracking & Response



Adaptability to Other Uses

Protection of Critical Infrastructure

- Rogue drones can be used to deliver explosive charges or CBRN agents as part of a terrorist attack against **Critical Infrastructure sites**
- Early detection of such drones can be used in **combination with various counter-drone measures** (entanglement nets, ballistic)

Protection of government officials

- Drones are a risk factor in case of public events where **government officials** or other VIPs can be the target of **attacks using drones** as means of delivery
- Early detection of such drones can be used in combination with various counter- drone measures (entanglement nets, ballistic) or evacuation measures



Project scope and organisation



WP1 – Ethics Requirements

- Setting of the ethics requirements



WP2 - Regulations & Methodologies

- Standardisation, certification and conformity assessment
- Safety & Security regulations
- Maritime borders security regulations
- Privacy and ethical issues
- Integration in the EUROSUR and the CISE frameworks



WP3 - Mission Requirements Definition in Maritime environment

- Survey and characterization of target performance levels
- User requirements collection and analysis
- Environmental conditions and expected hazards
- System architecture and specifications
- Mobile platform solutions (mechanical, energy and communication)



WP4 - Hardware & Sensors Development

- LIDAR platform development
- Visible and thermal CCTV platform development
- Acoustic sensing platform development
- Radio passive monitoring system development
- Mobile platform development

Project scope and organisation



WP5 - Algorithms & Software Development

- Video analytics engine adaptation
- Data fusion engine development
- GIS platform development
- Scenarios and decision support module development
- C2 server, interfaces and GUI development



WP6 - Prototype Development

- Overall system prototype design
- Integration of systems for standing configuration
- Integration of systems on deployable platform
- Integration of mixed platforms as one panoramic system
- Prototype testing
- Operational regulations and standards compliance



WP7 - Testing & Demonstration

- Development of operational test scenarios
- Users involvement and training and sites preparation
- Field Trial 1: North Sea Scenario & Demonstrations
- Field Trial 2: Mediterranean Scenario & Demonstrations
- Field Trial 3: Black Sea Scenario & Demonstrations
- Analysis and evaluation of test results



WP8 - Exploitation & Dissemination

- Characterization of the system and final specification
- Dissemination of results
- Strategy for exploitation of results

Safeshore challenges: Mission Possible!

Targets & Challenges

■ *During Safeshore*

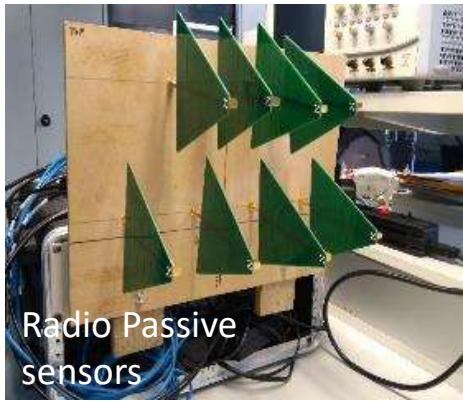
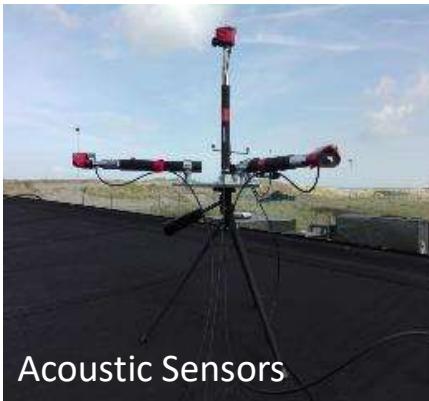
- Sensors development
- System Integration
- Data fusion and C2
- Testing at TRL 5

■ *Post Safeshore*

- Achieving TRL9



SafeShore Development Results



SafeShore C2 Application



SafeShore Tests

Integration Tests

- In-house tests of the integrated system

Field Trials

- Tests in 3 countries, in specific scenarios and field conditions
- Assess the accomplishment of the objectives
- Characterize the system
- Demonstrate the system to end users

Belgium – Lombardsijde
May 2018



Israel – Neurim
June 2018



Romania – Neptun
September 2018



Tests in Belgium

■ Scenarios

- BE01 Static VIP protection for major event near the shore
- BE02 Human trafficking across the English Channel
- BE03 Drugs trafficking using drones
- BE03 Fishing vessel monitoring
- BE05 Monitoring of kite surfers



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Tests in Belgium



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Tests in Belgium



Next tests – Israel, Neurim Beach

Scenarios

- IL01 Terror attack involving an armed RPAS
- IL02 Smuggling vessels
- IL03 Malicious commando force

Specifics

- Cliffs on the shore
- Equipment on the main platform to be split in two, one part on the beach, the other on the cliff



Final tests – Black Sea, Romania

■ Scenarios

- RO01 Critical infrastructure protection on shoreline
- RO02 Human trafficking and illegal migration across Romanian maritime border
- RO03 Drugs trafficking and smuggling using RPAS and vessels
- RO04 Small vessel monitoring during terrorist attempt attacks
- RO05 RPAS monitoring during terrorist attempt attacks
- RO06 Search for people in the water or on-board small inflatable boats, with the aim of rescuing them



Thank you!

