PREPARATORY ACTION ON DEFENCE RESEARCH

Session Unmanned Systems

INFODAY AND BROKERAGE EVENT
27 JUNE 2017

Does not represent an official legal opinion of the European Defence Agency

Agenda

- ✓ **<u>Call Text presentation</u>**
  - ✓ Specific Challenge, Scenarios
  - ✓ The selected domains
  - ✓ Budget and management of activities

- ✓ Information on EDA projects/studies
  - ✓ Unmanned maritime systems
  - ✓ Unmanned aerial systems
  - ✓ Sensors

- ✓ Q&A

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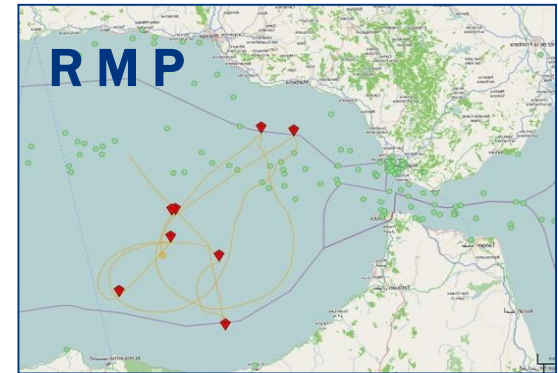PREPARATORY ACTION ON DEFENCE RESEARCH

Call Text presentation RA topic Unmanned systems

Technological demonstrator for enhanced situational awareness in a naval environment

Specific Challenge

Topic Unmanned Systems

Intelligence

Reconnaissance

ISTAR

Surveillance

Target Acquisition

Enabling

R M P

- Detection
- Identification
- Tracking
- Target Acquisition
- Interoperability

Technological demonstrator: UAS, USS, UUS

to enhance situational awareness for Defence operations in naval environment

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Scenarios

Topic Unmanned Systems

UXV... *to enhance situational awareness*

Persistent Wide Area Surveillance	Maritime Interdiction Operations

Genuine Defence Specific Requirements

Defence operations/activities in naval scenarios
- Adverse weather, high sea levels, or day and night operations
- Strong electromagnetic fields
- Deployment in contested environment
- Levels of protection appropriate to Defence-classified data

Domains

Topic Unmanned Systems

UXV... *to enhance situational awareness*

Proposals should balance R&T efforts in the following two areas:

Sensor Suite	Exploitation / Sharing of gathered data

- a more extensive integration and use of unmanned systems
- operated in a complementary way with other types of platforms and sensors

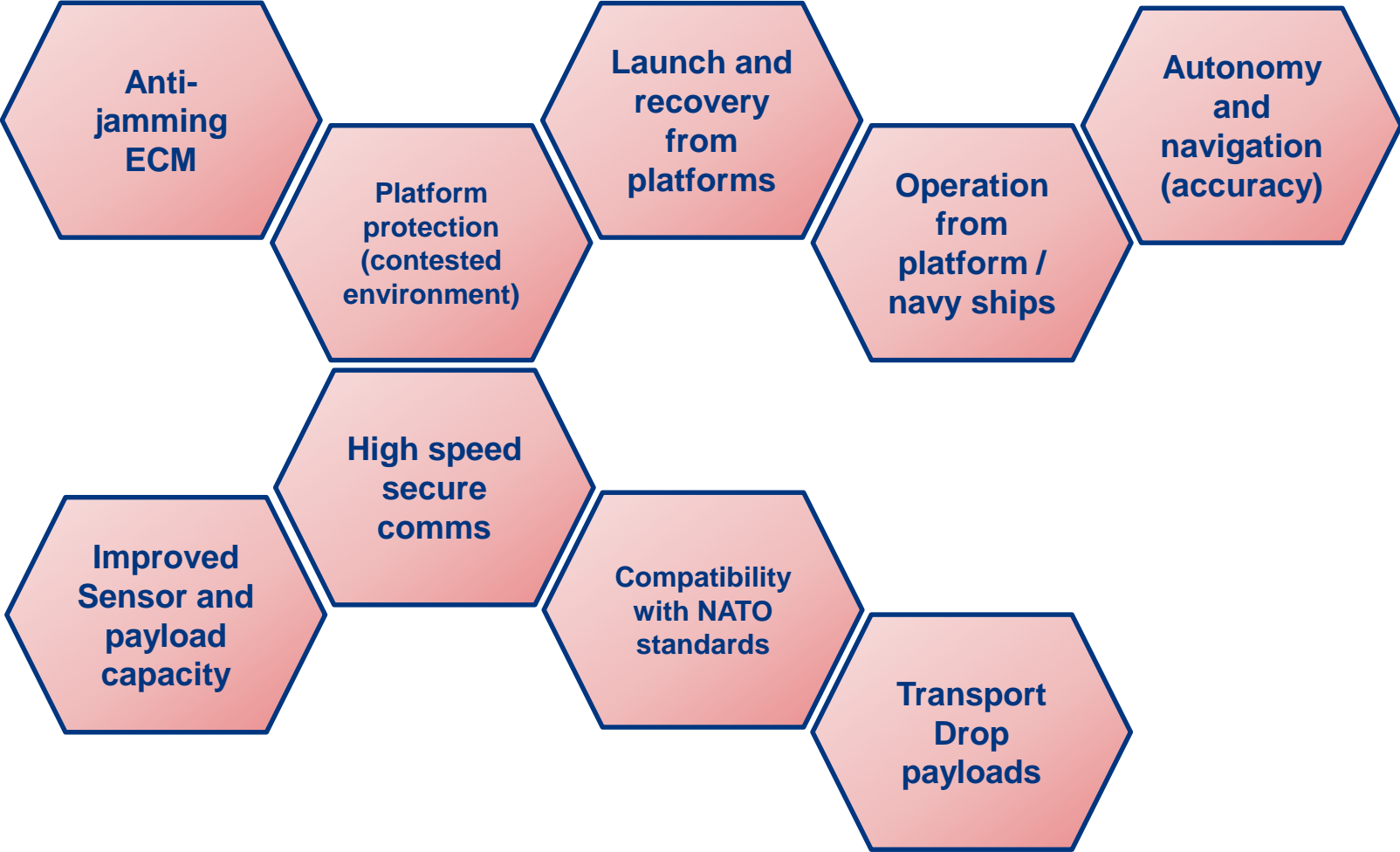- real time or near real time transfer of data
- secured transfer of data

Scope – Sensor Suite

Topic Unmanned Systems

- To develop RPAS or other UXS solutions which would be operated from navy ships

- Defence specific requirements:
  - Payload capacity,
  - Enhanced Several sensors (at least 2 major sensors on-board),
  - Persistence,
  - Endurance and range,
  - Autonomy and optimization of operators work-load,
  - EMC/EMI compatibility, operations (including launch and recovery) at sea from navy ships under extreme conditions,
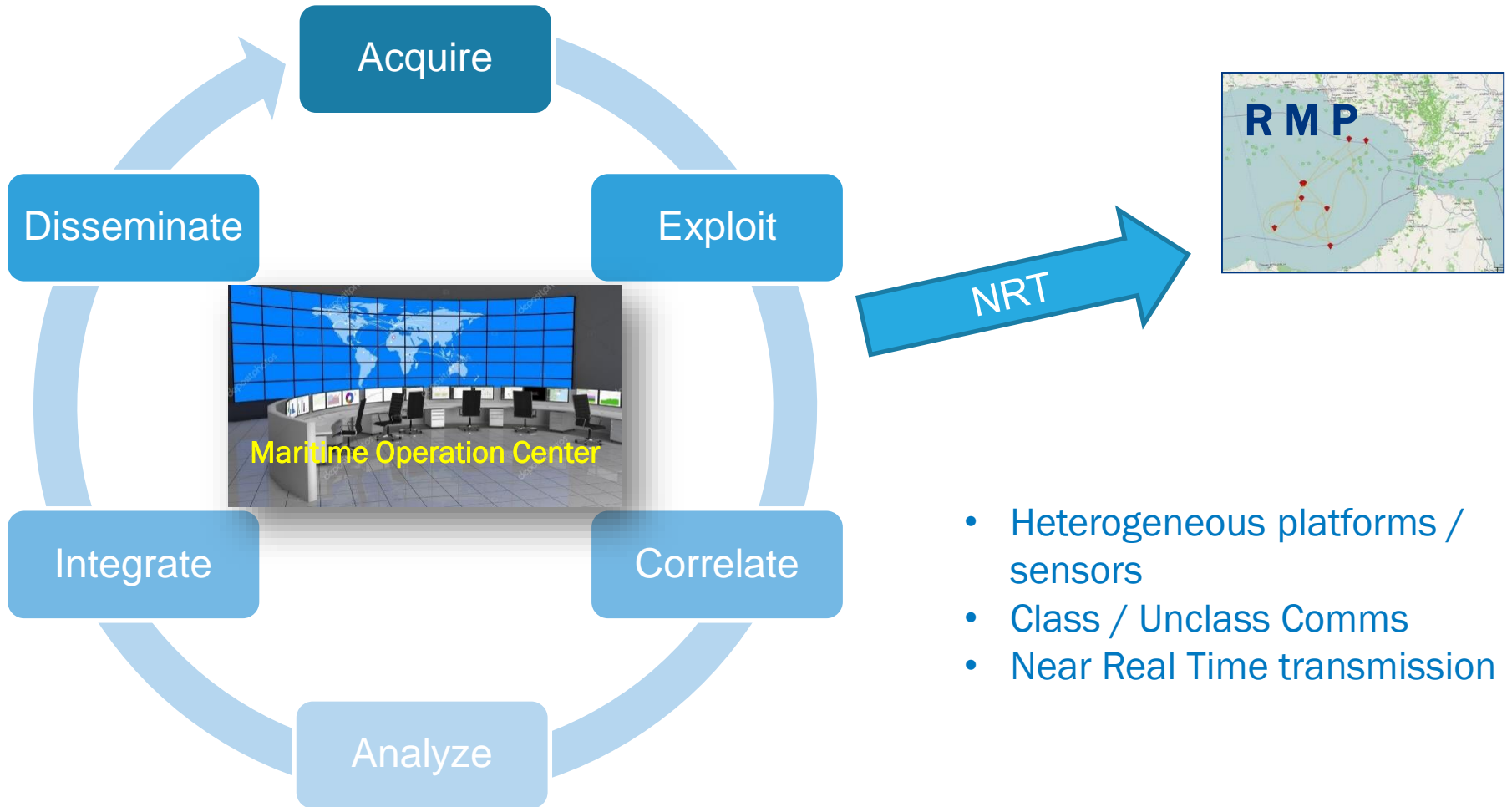 - Survivability
  - Resilience and redundancy of C2 links

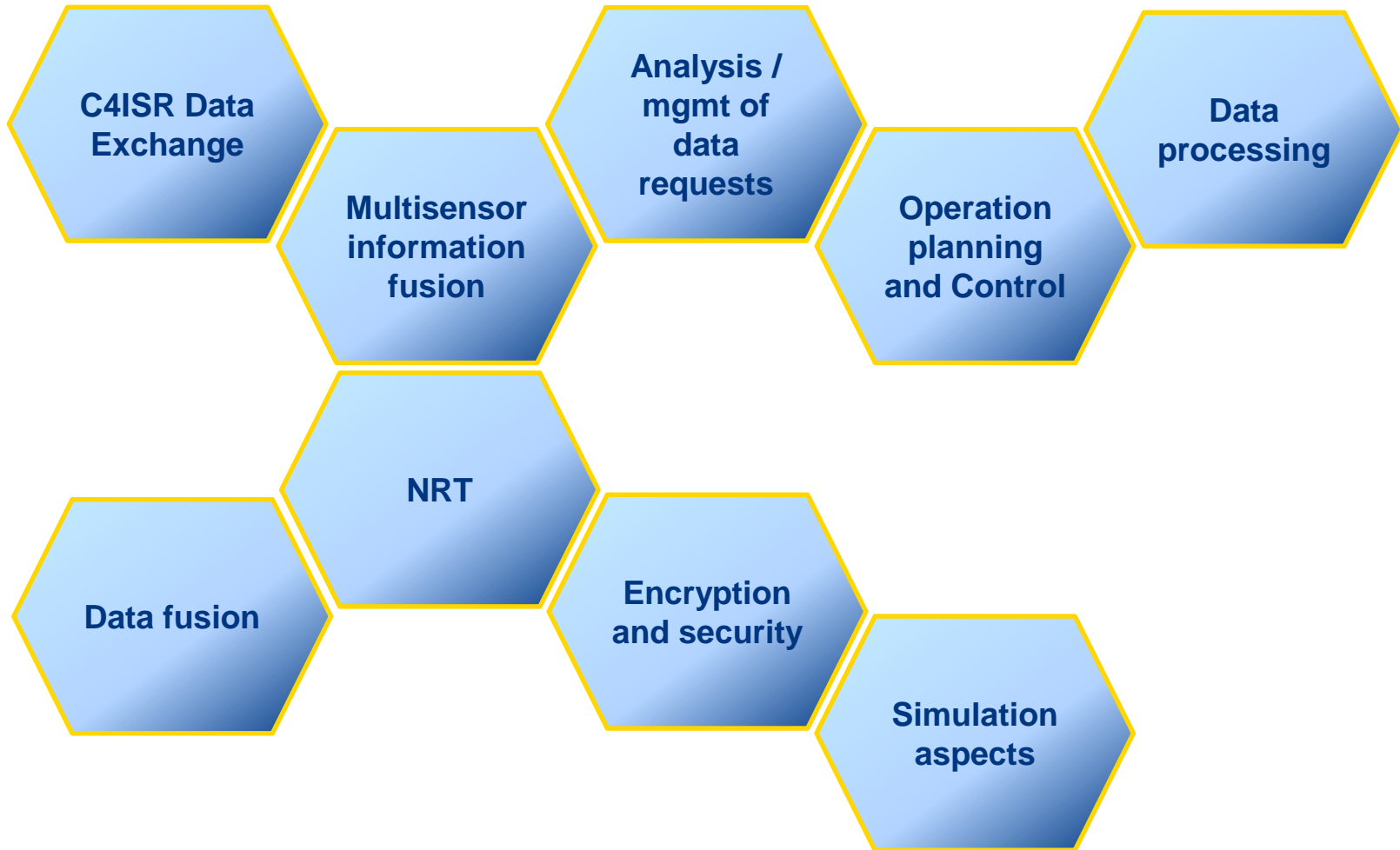# Scope – Sensor Suite

Topic Unmanned Systems

Anti-jamming ECM

Platform protection (contested environment)

Launch and recovery from platforms

Operation from platform / navy ships

Autonomy and navigation (accuracy)

High speed secure comms

Improved Sensor and payload capacity

Compatibility with NATO standards

Transport Drop payloads

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Scope – Exploitation / Sharing data

Topic Unmanned Systems

Acquire

Exploit

Correlate

Analyze

Integrate

Disseminate

Maritime Operation Center

NRT

R M P

- Heterogeneous platforms / sensors
- Class / Unclass Comms
- Near Real Time transmission

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Scope – Exploitation / Sharing data

Topic Unmanned Systems

- C4ISR Data Exchange
- Multisensor information fusion
- Analysis / mgmt of data requests
- Operation planning and Control
- Data processing
- NRT
- Data fusion
- Encryption and security
- Simulation aspects

The proposal
Topic Unmanned Systems

- The implementation of this topic is intended to:
    - start at TRL 4 and
    - target TRL not lower than 6 and not higher than 7.

- Total contribution up to 35.50 M€
    - 15.50 M€ - core part, 2017 Budget (approved)
    - Up to 4 additional research modules, up to 5M€ each from 2018 (planned, pending budget approval)

- At least <u>five legal entities</u> shall participate in an action, established in different Member States or Norway and independent of each other (General Annex C)

- To determine the ranking, the score for the criterion 'impact' will be given a <u>weight of 1.5</u>

www.eda.europa.eu

The proposal

Topic Unmanned Systems

- Single submission of a full proposal, followed by a single evaluation

- No more than one action will be funded

- The participation of SMEs in the proposal is strongly encouraged ("Implementation" criterion)

Expected Impact (1/2)

Topic Unmanned Systems

- Convincing demonstration of the potential of EU-funded research for defence applications;

- Reliable operation of the proposed solutions in various, complex and extreme maritime environments;

- Substantial gain towards autonomous and safe operation of UXS from navy ships offering suitable potential in term of payload capacity, range and handling quality for operations under adverse conditions;

- Enhancement of maritime situational awareness and command and control capability and secured data exchange and real time or near real time transmission of information;

- Development of the European industrial capability in the market segment of unmanned systems for defence capabilities;

Expected Impact (2/2)

Topic Unmanned Systems

- Improved interoperability between manned and unmanned systems;

- Improved interoperability with existing, multilateral EU defence systems and infrastructures, and with naval platforms and mission systems;

- Extended capabilities of a vessel platform, fully integrated with the vessel mission system (CMS and sensors);

- Improved efficiency and cost-effectiveness;

- Informing the shape of future military structures in view of the use of advanced unmanned systems.

Management of the activities

Topic Unmanned Systems

- The activities of the project should focus mainly on maturing and integrating validated technologies.

- Part of the project can be carried out by using computer-based modelling and simulation tools, to allow de-risking of the demonstration.

- Moreover, the project shall provide a full-scale technological demonstration at least in a relevant environment of mixed manned/unmanned assets.

- If deemed appropriate, the proposal could include a demonstration in an operational environment, e.g., in conjunction with armed forces

Management of the activities
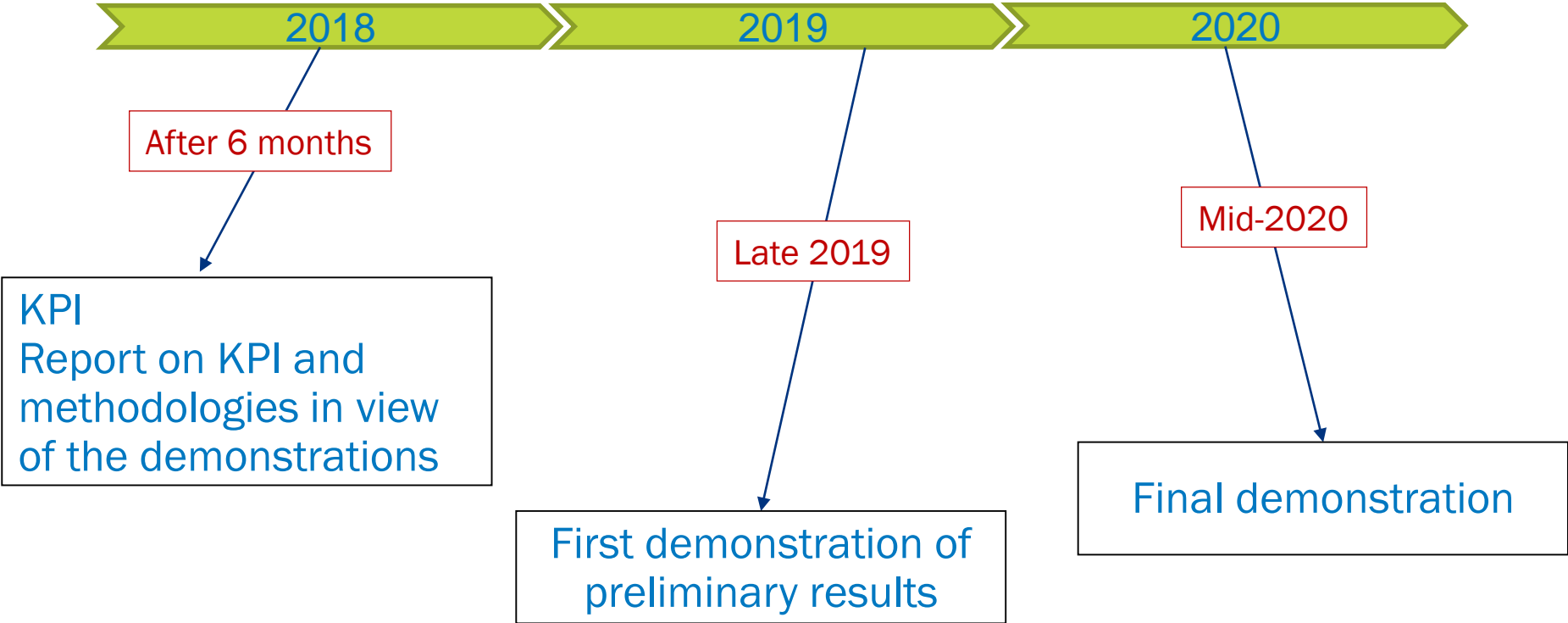
Topic Unmanned Systems

| 2018 | 2019 | 2020 |

After 6 months

Late 2019

Mid-2020

KPI
Report on KPI and
methodologies in view
of the demonstrations

First demonstration of
preliminary results

Final demonstration

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Information on EDA projects / studies

Unmanned maritime systems

Project portfolio/UMS projects (1/2)

Unmanned Maritime Systems

|	Project name
Overall UMS issues	Systems Integration
	Standard and Interfaces for more Interoperable European UMS
	Safety and Regulations for European UMS
Multiple applications	Network Enabled Cooperation System of Autonomous Vehicles
	Robust Acoustic Communications in Underwater Networks
	Conformal Array Performance Estimation Modelling
	Submarine Coupled 6D of Motions Including Boundary Effects
	Study of Hybrid Fuel Cells Energy Interoperable System

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Project portfolio/UMS projects (2/2)

Unmanned Maritime Systems

	Project name
Mine hunting	Increased Autonomy for Autonomous Underwater Vehicles (mission planning and obstacle avoidance)
	Drifting Mines Detection
	Buried Mines
Mine sweeping	Modular Light-Weight Minesweeping
	Signature Response Analysis of Multi-influence Mines
Other applications	Evaluation of Thin Line Array Technologies
	Harbour and Base Protection Systems

Examples of projects

Unmanned Maritime Systems
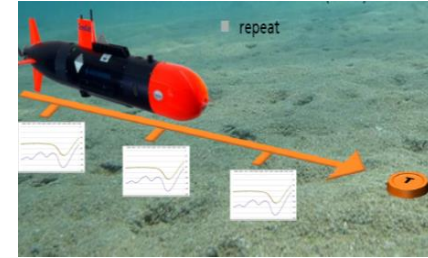
- (MLM) Modular Lightweight Minesweeping

  - Future Minesweeping concept: smaller lightweight unmanned surface vehicles (USV's) equipped with lightweight sweep sources, either operating alone or together with other vehicles in a formation.

  - The objective of the project was to demonstrate an unmanned lightweight modular minesweeping system.

- (BURMIN) Buried Mines

  - Eliminate the technological gaps in the field of bottom/buried mines detection and neutralization

  - Sensor technology for buried mines (magnetic, electromagnetic, acoustic, electrochemical), Methods for combining sensor outputs into a fused coherent picture of the situation

Examples of projects

Unmanned Maritime Systems

- (RACUN) Robust Acoustic Communications in Underwater Networks
  - Demonstrated underwater acoustic communications and networking technology for tactical scenarios
  - the setup of an ad hoc underwater network encompassing heterogeneous assets
  - a fully developed workflow for the characterisation of underwater acoustic communications and networks

RPAS ATI Industrial R&D (1/2)

Unmanned Aerial Systems

- MID-Air Collision Avoidance System (MIDCAS)
  - Design and development of a DAA system. Simulation and flight tests. Integration in ATM. Manual and automatic collision avoidance.
  - First phase finished September 2015 after flight test campaign.
  - MIDCAS SSP → Standardisation, 2 years, ongoing.
  - http://www.midcas.org/

- Enhanced RPAS Automation (ERA)
  - Automatic take off and landing. Automation and Emergency Recovery. Simulation and flight tests. Integration in ATM. Airworthiness.
  - Project launch February 2016.

- Command, Control and Communications (C3)
  - Current state of the art of SATCOM C3 datalink. Required Communications Performance. Simulation and flight tests. Integration in ATM.
  - 1.5 years, ongoing
  - https://artes-apps.esa.int/projects/desire-ii

RPAS ATI Industrial R&D (2/2)

Unmanned Aerial Systems

- Global Study on DAA (DASA)
  - Global assessment of the DAA state of the art. Impact on ATM.
  - DAA certification roadmap proposal (Technology – ATM - Airworthiness).

- Remote Pilot Stations Standardisation
  - R&D activities and support to standardisation of RPS with EUROCAE.
  - EASA's certified operations category.
  - 1.5 years, ongoing

- TRAWA: Remain Well Clear
  - Objective: Standardisation of Remotely Piloted Aircraft System (RPAS) Detect and Avoid

https://www.eda.europa.eu/what-we-do/activities/activities-search/remotely-piloted-aircraft-systems

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Information on EDA projects / studies

RF Sensors

RF Sensors studies

Information on EDA Projects / studies

- UCAR (UAS Conformal AESA Antennas Roadmap): 2013-2014
  - Technology roadmap for the integration of conformal AESAs to enable the integration of multifunction systems on UAS

- RM4RFM (Resource Management for RF Multifunction Systems): 2014-2015
  - Management of resources for multi-function radio frequency systems (MFRFS) for remotely piloted aircraft

- MEDUSA (Multi Sensor Data Fusion Grid for Urban Warfare): 2011-2012
  - Research and implementation of a sensor data fusion engine distributed over a grid able to fuse data coming from different heterogeneous sensors.

- SARINA (SAR based augmented Integrity Navigation Architecture): 2011-2012
  - Designing and assessing a novel a/c INS (Inertial Navigation System) for Unmanned Platform (UAV, Missile)
  - Use of features extracted from SAR Imagery and on-board terrain Landmark DB
  - Increase robustness against uncompensated IMU (Inertial Measurement Unit) errors due to possible GPS lack of integrity (fault, jamming).

RF Sensors studies

Information on EDA Projects / studies

- ITP SIMCLAIRS (Innovation and Technology Partnership for Studies for Integrated Multifunction Compact Lightweight Airborne Radars and Systems): 2009-2013
  - New technology solutions in the field of light and compact Unmanned Aerial Vehicle (UAV) Radio Frequency (RF) payloads
  - Combination of Synthetic Aperture Radar / Moving Target Indicator (SAR/MTI), Foliage Penetrating (FOPEN), Electronic Support Measures (ESM) and possibly communications.

- ASIMUT (Aid to Situational Management based Multimodal, Multi-UAVs, Multi-level Acquisition Techniques): 2015-2017
  - Architecture and simulation regarding a novel Inertial Navigation System based on SAR data from airborne platforms
  - Design, implement and validate algorithms allowing efficient usage of autonomous swarms of UAVs for surveillance missions

- SPIDER (Sensor Platform & Network for Indoor Deployment and Exterior-Based Radiofrequency): 2016-2017
  - Development of an innovative system to support urban warfare operations by providing improved situational awareness inside buildings
  - Sensor network located at both exterior and interior building areas
  - Outdoor subsystem is a network of radiofrequency sensors that aims to recognize humans inside the building.

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Q&A