

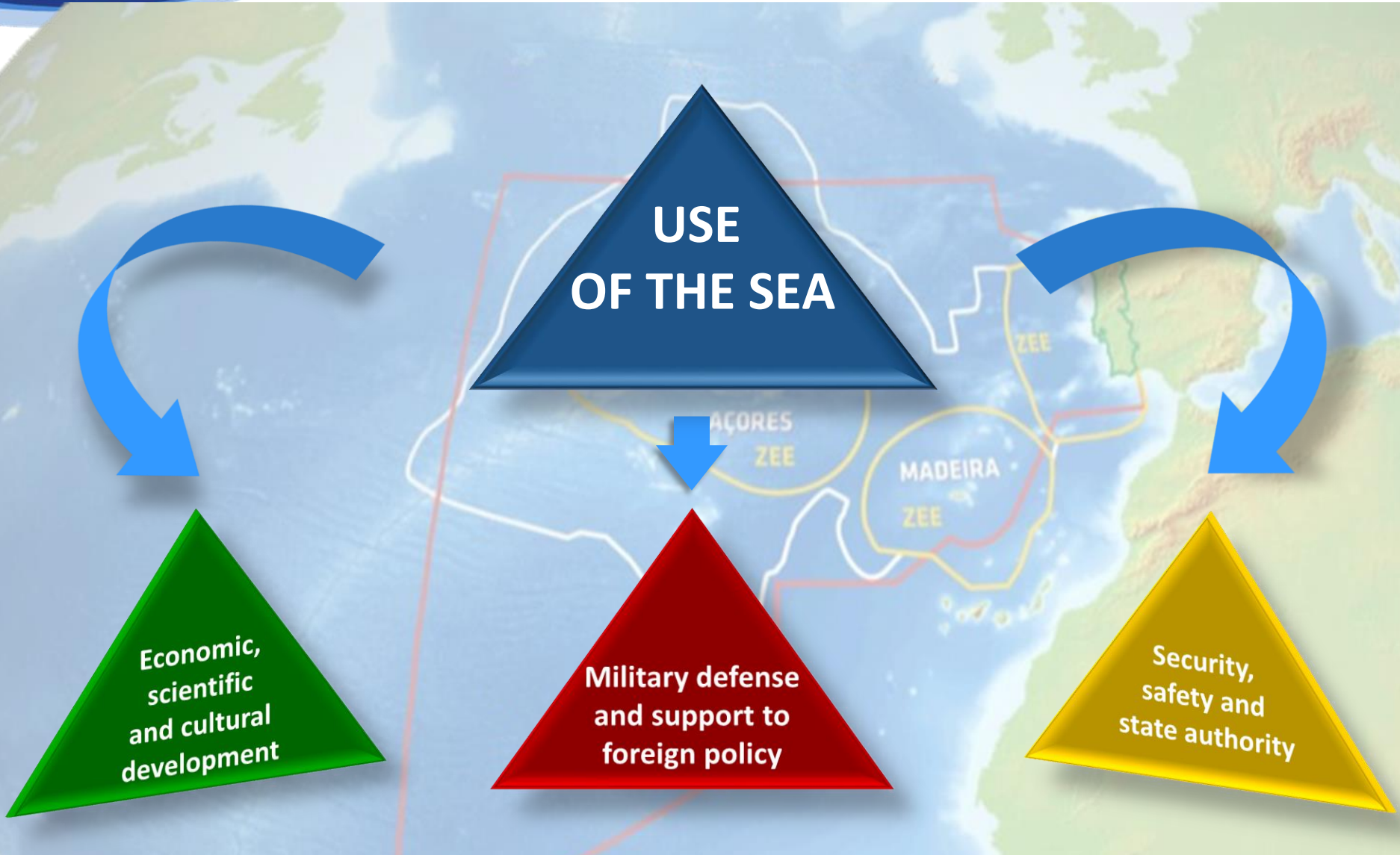
# The Portuguese Navy and Naval Academy

EX'16 & Summer School on Introduction to Advanced Marine Technology

27JUN16

Prof. Victor Lobo





Firm in defense, engaged in security, partner in revelopment  
(Firme na Defesa, Empenhado na Segurança, Parceiro no Desenvolvemento)

# RESOURCES AND ASSETS

**POWER PROJECTION**



**PATROL AND SURVEILLANCE**



**MARITIME AUTHORITY**



**SURFACE**



**POLLUTION CONTROL**



**NAVIGATION AIDS**



**SUBSURFACE**



**MINES**



**HYDRO OCEANOGRAPHIC**



**COMMAND & CONTROL**



# Why used unmanned ?

Traditionally, for DDD missions:

**Dull**

**Dirty**

**Dangerous**



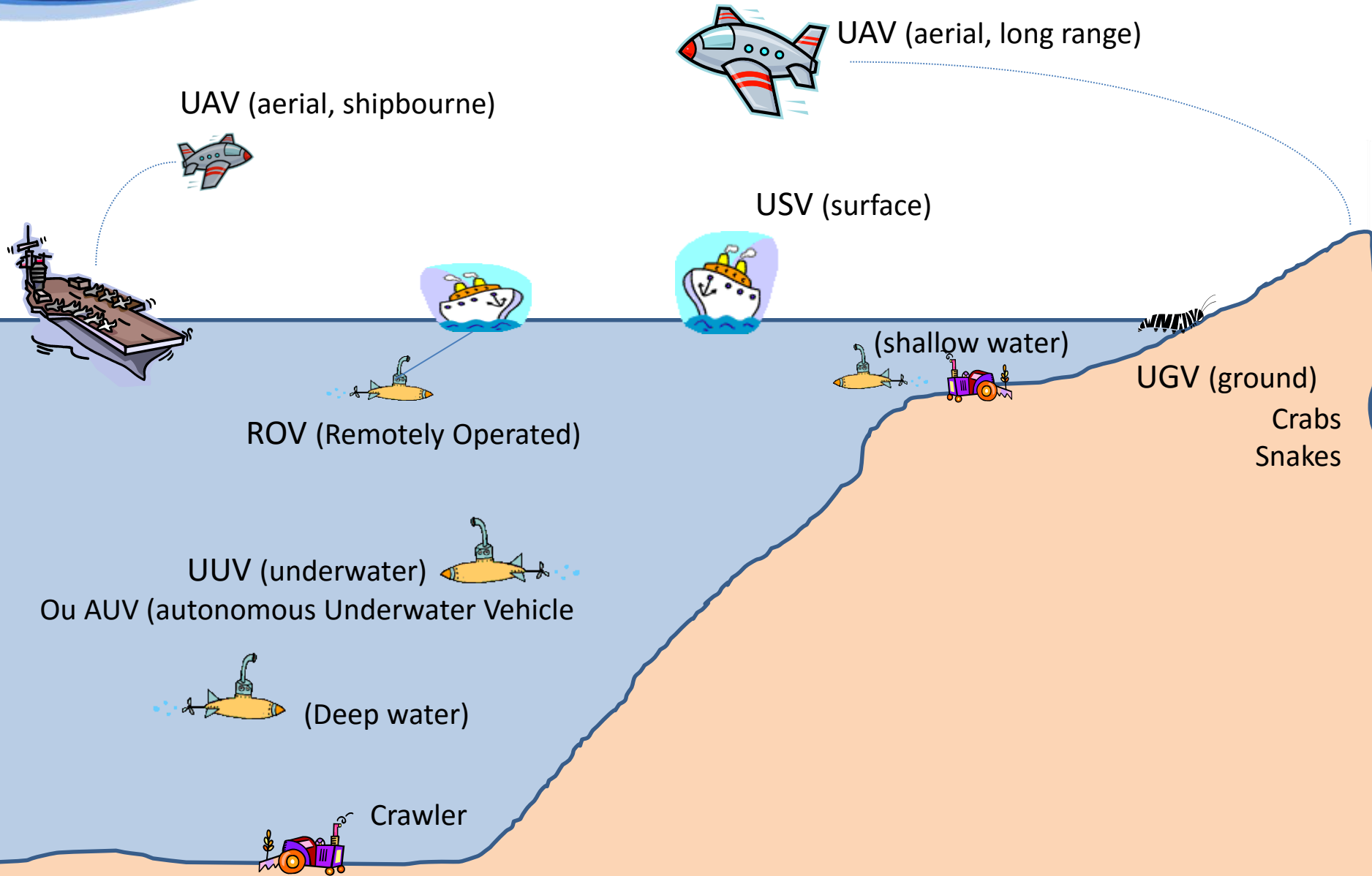
# What type of missions ?

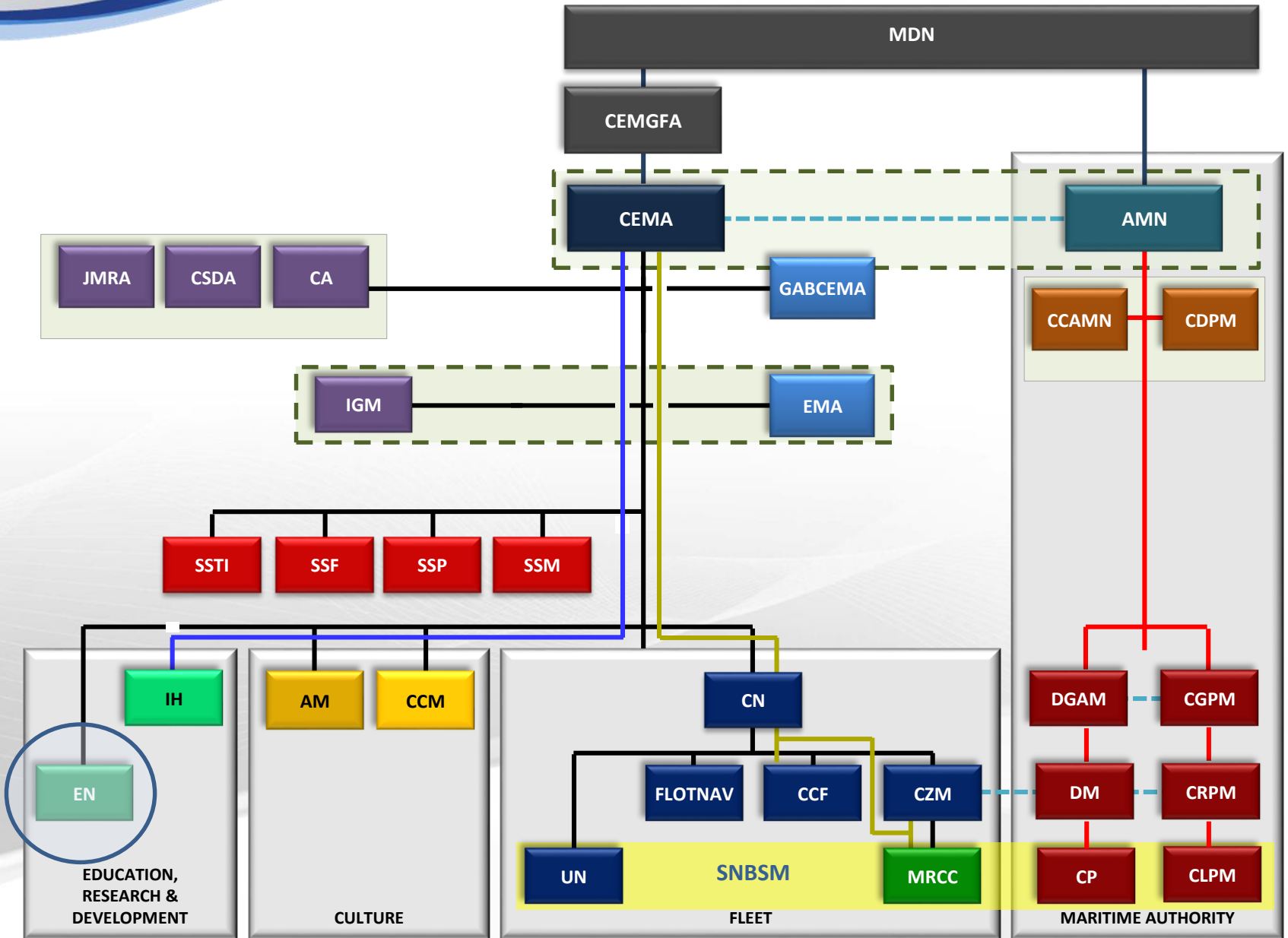
- Mine Warfare**
- Hydrographic Surveys**
- Search & Rescue (SAR)**
- Persistent Surveillance**
- Environmental Monitoring
- Pollution Control
- Protecting Installations
- Exploration
- Oil extraction, Mining,
- Underwater cable
- installation/monitoring



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# UxV - Unmanned "x" Vehicle

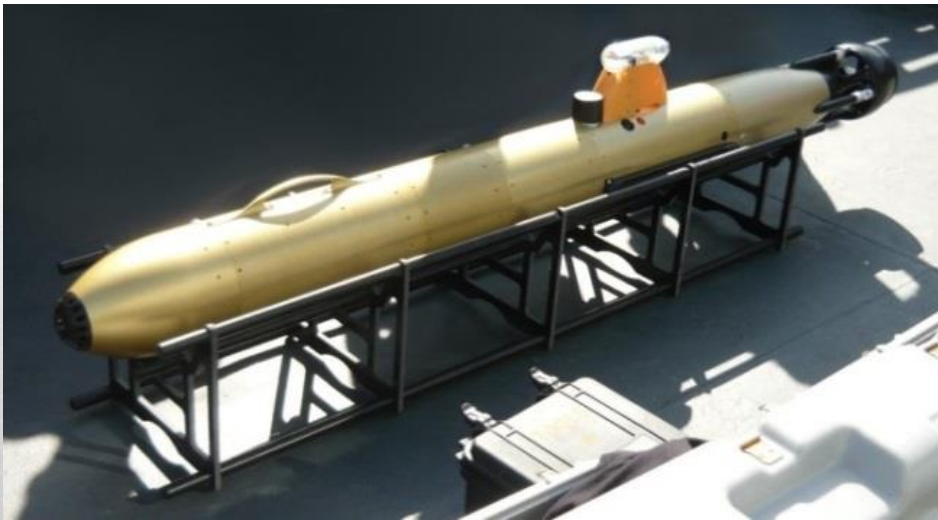




# Current use of unmanned vehicles

2 Systems currently in operational use by the Portuguese Navy:

- Gavia (Teledyne)
- SeaCon (University of Oporto/ OceanScan)

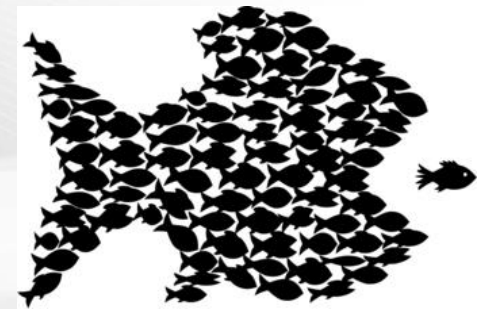


Primary Mission: Mine warfare

They are regularly used in “real missions”



- **Interoperability** and standards
  - Common standards for UxS
  - Common support tools (for operation and development)
- **Multivehicle** systems
  - Swarm and cooperative behaviour
- **Autonomy**
  - Energy and maintenance
  - Behaviour - Safety and Ethics





## The Portuguese Naval Academy

REX'16 & Summer School on Introduction to Advanced Marine Technology

27JUN16

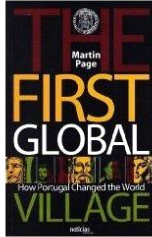


SERVIR PORTUGAL NO MAR



*Alma Mater*

*Talant de Bien Faire*



“Sagres’ School”

**1559** Royal Cosmographer Class

**1782** Academia Real dos Guardas-Marinhas (Midshipmen Academy)

**1807** Academy in Brazil

**1837** Escola Politécnica

**1845** Escola Naval

**1936** Escola Naval in Alfeite





IUM  
CC-MGC

CESM



A3ES

Agência de Avaliação  
e Acreditação  
do Ensino Superior

Ministério da  
Educação

Escola Naval is a **Military University** that transforms cadets into Naval Officers

- Ready for Sea
- Academically proficient
- Skillful in command and leadership



## Master in Naval Military Sciences

Line Officers

Naval Engineering

Mechanics

Weapons and Electronics

Marines

Naval Administration

Naval Medicine \*



## Others

CFBO

CFCO / CFMCO

## Bachelor in Naval Military Technology

Mechanics

Weapons and Electronics

Accounting, administration and secretariat

Hydrography

Computer Technology

Communication

Marines

Divers

Master in “*Maritime History*”  
4<sup>th</sup> edition - 11 students



Master in “*Military History*”  
1<sup>st</sup> edition - 8 students



Master in “*Hyperbaric and Underwater Medicine*”  
2<sup>nd</sup> edition - 10 students



Master in “*Information Security and Cyberspace Law*”  
2<sup>nd</sup> edition - 10 students - Master Approved



Master in “*Hydrographic Engineering*”  
1<sup>st</sup> edition - 8 students





Master in “Organizational Behavior - Leadership”



Doctorate in “History” specialized in “Maritime History”



Master in "Navigation and Satellite Positioning”

Doctorate in “Navigation”

Master in “Meteorology and Physical Oceanography”



Master in "Management and Maritime Areas"



Instituto Superior  
de Economia e Gestão

Master in “Maintenance Management”

Master in “Maritime Authority”

Master in “Sea and Harbor Law”



Postgraduation in “Underwater Archeology”



Master in “Maritime Business”

## Sea Training Military Training

### Leadership

- Admission / Selection
- Field Exercises
- River rafting
- Tutoring
- And, in every opportunity

### Close Order Drill

### Physical Training

## Ethics, Moral, Citizenship and Cultural



Seamanship Classes

3 hours/week

Simulator Navigation

FSHS

Onboard Summer Training

Every academic year

Weekend Cruises

3 to 4 per year per student

Sailing Cruises

Easter and Summer

Traineeship

10<sup>th</sup> semester



# SEA TRAINING - SAILS & LINE SHIPS



Canopus



Polar



D. Carlos



Cacine



Sagres



Blaus



Vasco da Gama



Baptista de Andrade



Deneb



Viana do Castelo



João Coutinho



Bellatrix



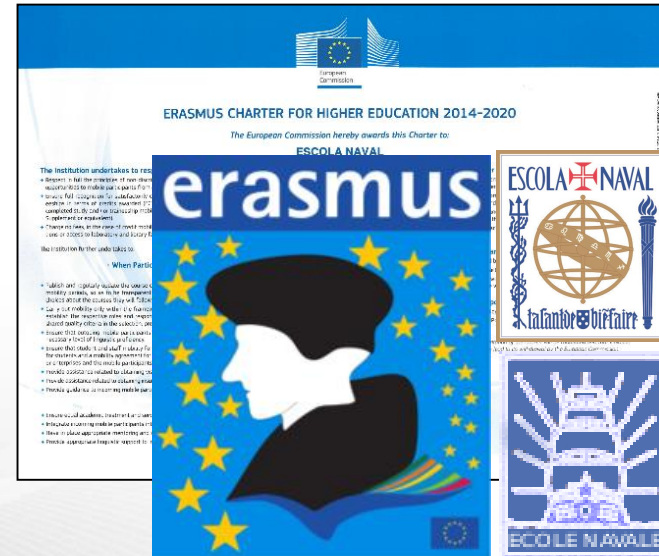
Creoula



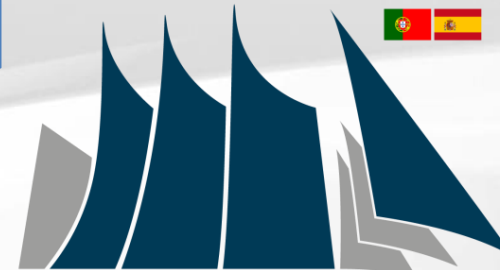
Bérrio



Bartolomeu Dias



Conhecimento y Aventura



**UIM** Universidad Itinerante de la Mar  
Universidade Itinerante do Mar



## Hydrographic Institute

Official state laboratory  
serving both the Navy and other government bodies,  
It's mission includes R&D in



Oceanography, Hydrography, Navigation, Nautical Cartography,  
Maritime Geology, and Maritime Chemistry and Pollution



## CINAV

R&D in all other areas with interest to the Navy  
R&D coordination amongst Navy services and units  
R&D in all areas relevant fo the Naval Academy  
including cooperation with the Hydrographic Institute  
in it's area of expertise



## **CINAV** – PRT NAVY Research Center

- Created in 2010
- Located at the Portuguese Naval Academy

## **Mission**

R&D in areas of interest to the Navy

## **Promote and support R&D at the Naval Academy**

- R&D activities of faculty and cadets
- MSc thesis of cadets and Navy Officers
- Laboratorial support

## **Coordinate and supervise R&D activities throughout the Navy** in all areas not coordinated by the Hydrographic Institute

- Research projects developed by navy units and services
- Support R&D needs of the Navy



# 7 Research Lines

## Naval Health

Hyperbaric  
Medicine,  
Physical Condition  
(32)

## Signal Processing

Underwater  
Acoustics  
Communications  
(6)

## Maintenance Engineering

Condition Based  
Maintenance,  
Vibration Analysis  
(6)

## Mobile Robotics

autonomous  
vehicles  
Underwater,  
surface, aerial  
(21)

## 45 Projects

25 full members (PhD)  
108 associate  
members

## Maritime History

Age of Discoveries and  
Expansion, Navigation  
History, Underwater  
Archeology  
(13)

## Maritime Strategy

Geopolitics,  
Strategy for the  
Oceans  
(12)

## Decision Support Systems

Maritime Situational  
Awareness, Harbour  
protection, GIS, Business  
Intelligence and  
management, AI in Naval  
Architecture  
(16)

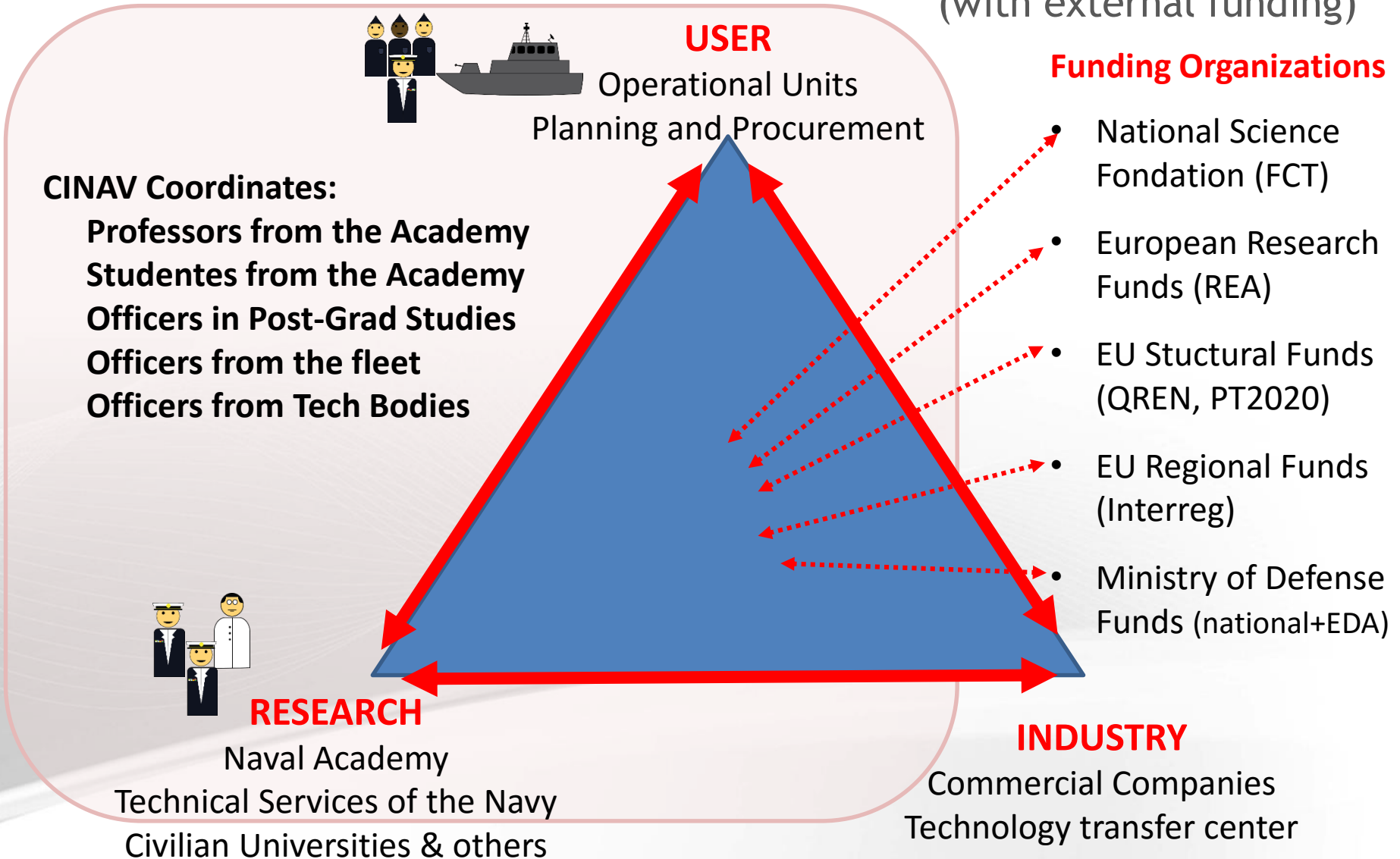
## “Non-integrated” Research areas

Meteorology, Energetic Materials and explosives,  
Communication Systems, Leadership and organizational Behavior



# Research model within CINAV

User+Research+Industry = Success !  
(with external funding)



# Cooperation R&D with other entities

Why ?

It's part of our mission: “ **Partners in development** “

We are a small center in a small Navy with Big Responsibilities

How ?

Joint research projects

National

International (H2020, EDA)

Naval Exercises for R&D

Field tests and demonstrations

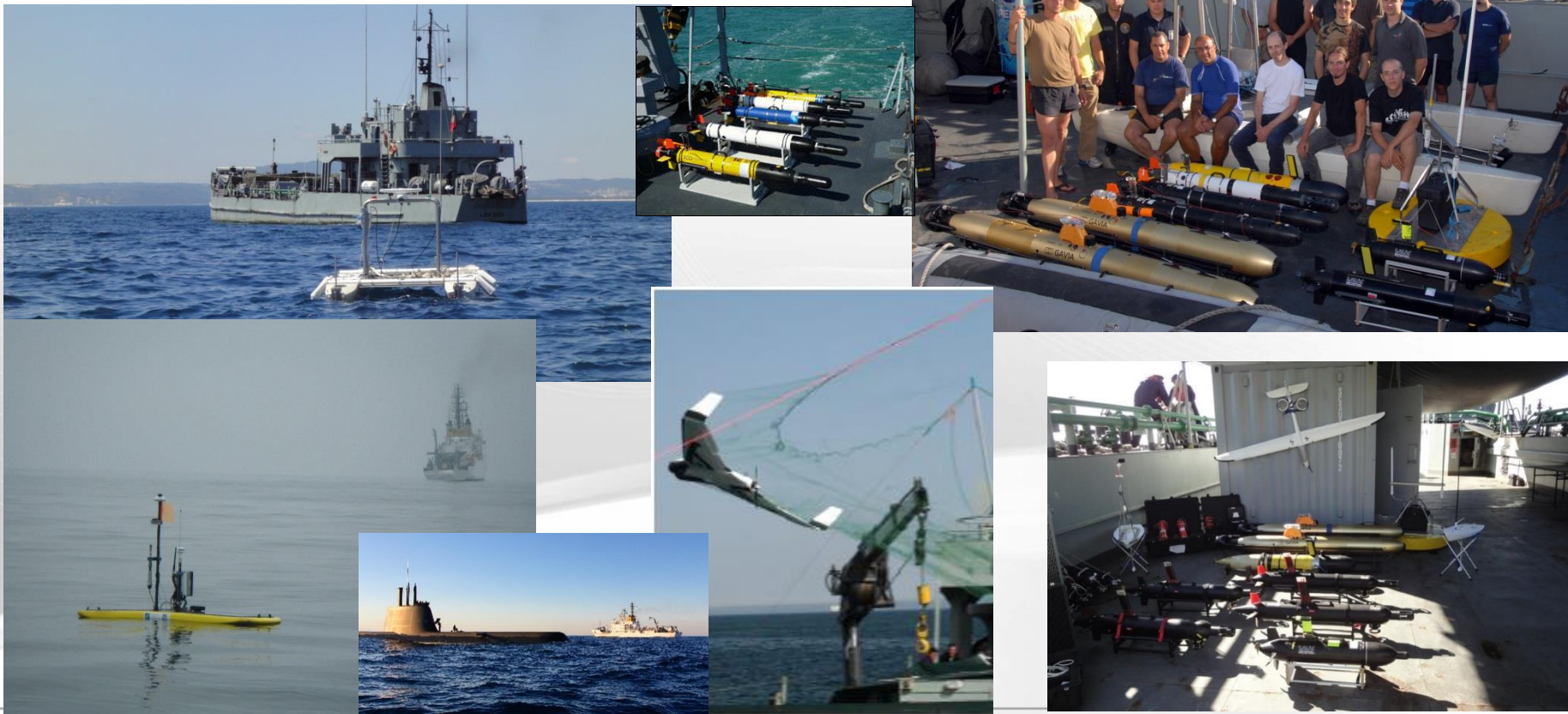
**REP exercises** with FEUP

**REX exercises** open to various partners

Thesis co-supervision



**R**apid **E**nvironmental **P**icture (or Recognized Environmental Picture)  
Annual exercise for **Concept Development and Experimentation**, and  
technology **testing** and **data gathering**  
Since 2010 with the University of Porto  
Cooperation with CMRE, MBARI, etc.



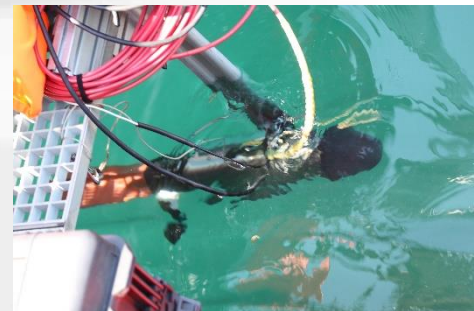
## Robotics Exercise

Annual since 2013

More experimental and *open* than REP

Support for R&D projects of CINAV

Strong interaction between the **Operational Community** and **Researchers** and **Industry**



# Mobile Robotics Projects

Strategic research area for future naval operations

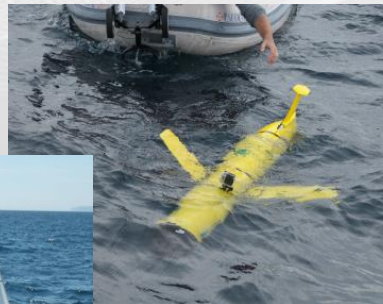
Develop know-how in support of operational needs

**Underwater** vehicles - SeaCon, SeaCon II, NECSAVE, Mission Planning, Robonoise, **Turtle**, Networked Ocean

**Surface** vehicles- ICARUS, E-Ventos, Robonoise

**Aerial** vehicles - Seagull, Sunny, Pelicano, Autoland, Perseus, Andromeda, GammaEX

Partners: FEUP, INESC-TEC, Univ.Algarve, Critical Software, Tekever



Utilizador: Destacamento de Guerra de Minas

Desenvolver um UUV (Underwater Unmanned Vehicle) para operações em áreas confinadas

Desenvolver métodos para a operação cooperativa de múltiplos veículos

Exercício com múltiplos veículos na Costa da Galé, no Verão de 2010



Veículo submarino desenvolvido em cooperação com a Faculdade de Engenharia da Universidade do Porto

# Projecto ICARUS

Tecnologias de veículos autónomos para apoio humanitário em catástrofes  
C/ INESC-Porto, Academia Militar Belga (RMC), NURC, etc  
Financiado pelo **FP7** da União Europeia

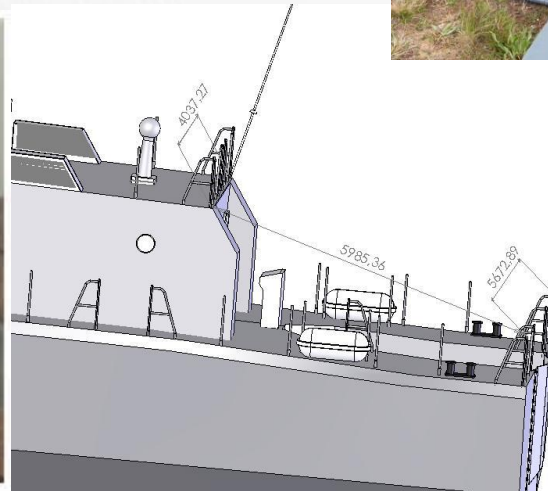


Adaptar o UAV AR4 da Tekever

Na sequência do primeiro trabalho em robótica móvel do CINAV em 2004

Aterragem automática em meios navais

Projecto **QREN**





## Vela autónoma

### Desafio de robótica

#### MICROTRANSAT

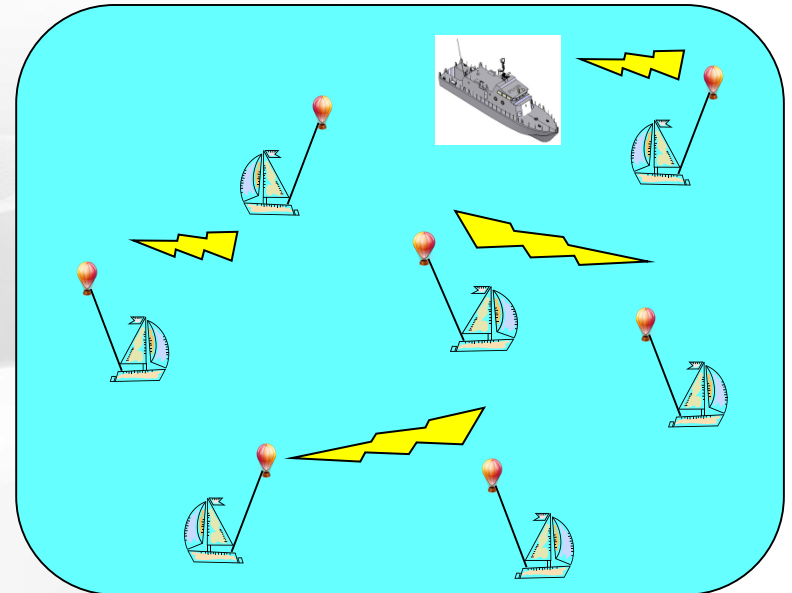
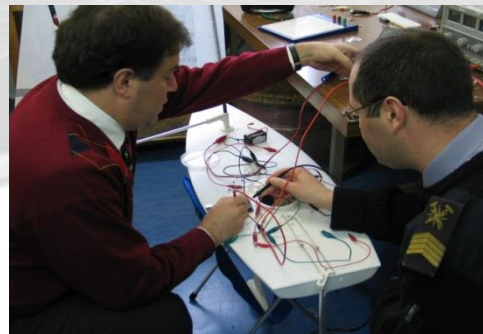
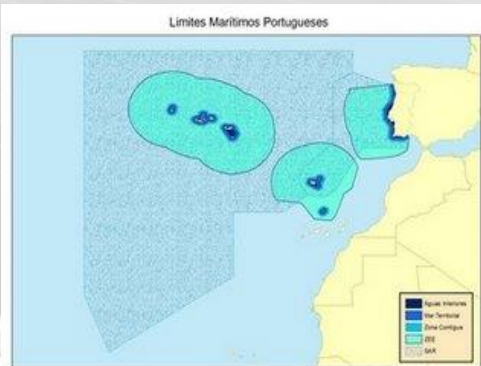
Atravessar o atlântico !

#### MAROCUP

Regatas de vela autónoma

Aberto a Universidades e escolas !

### Rede de sensores para vigilância



*Smart UNmanned aerial vehicle sensor Network for detection of border crossing and illegal entry*

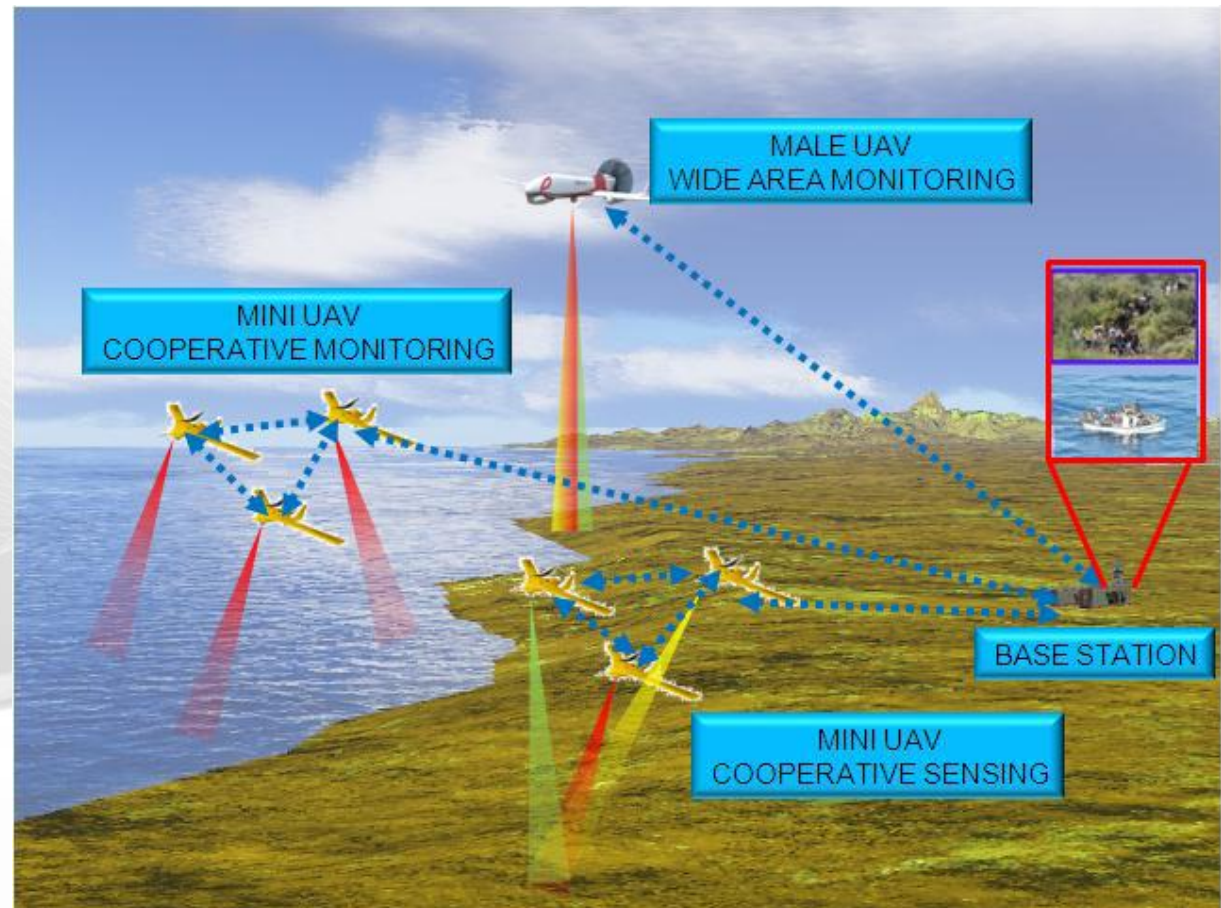
Sistemas de sensores e sistemas de apoio à decisão para detetar entradas ilegais em águas da União Europeia (EU).

FP7

Parceiros:

INESC-TEC

FAP



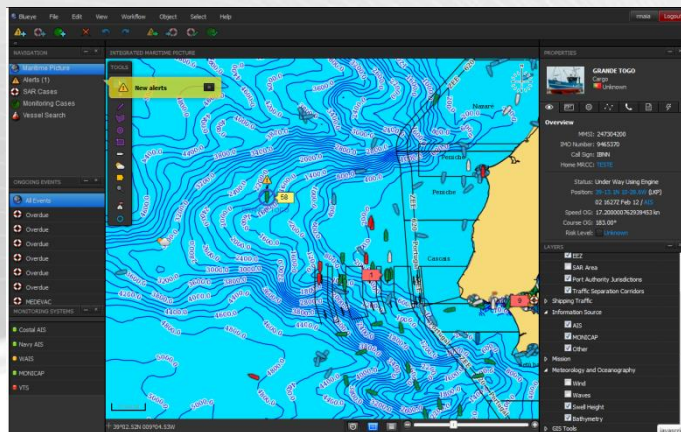
Integração das plataformas do projecto PITVANT no sistema  
Oversee (projecto BlueEye)

Sensores a bordo do UAV

AIS

Câmaras (gama visível)

Talvez radar (SAR de baixo custo), imagens multiespectrais fora do visível



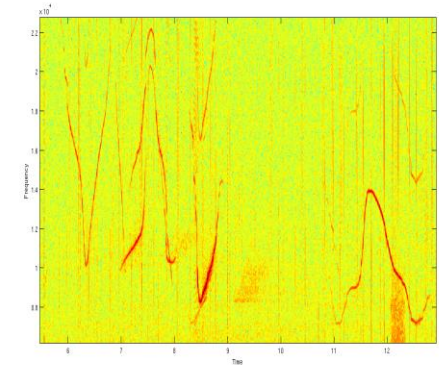
Monitorização Ambiental com Veículos Autónomos

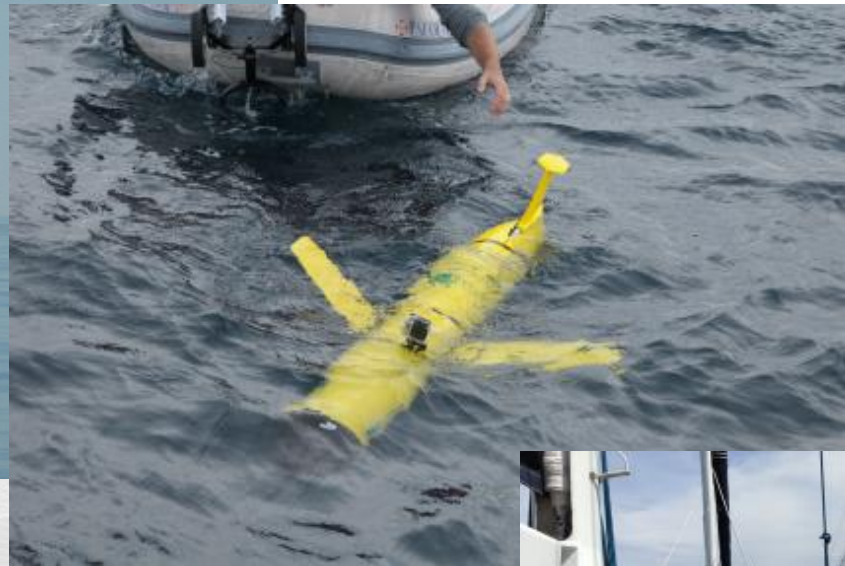
Exercício decorreu de 5 a 7 de Maio de 2012

Utilização de um Glider e de um veleiro autónomo, e um sistema de hidrofone/gravador de fabrico português, a sul de Sesimbra

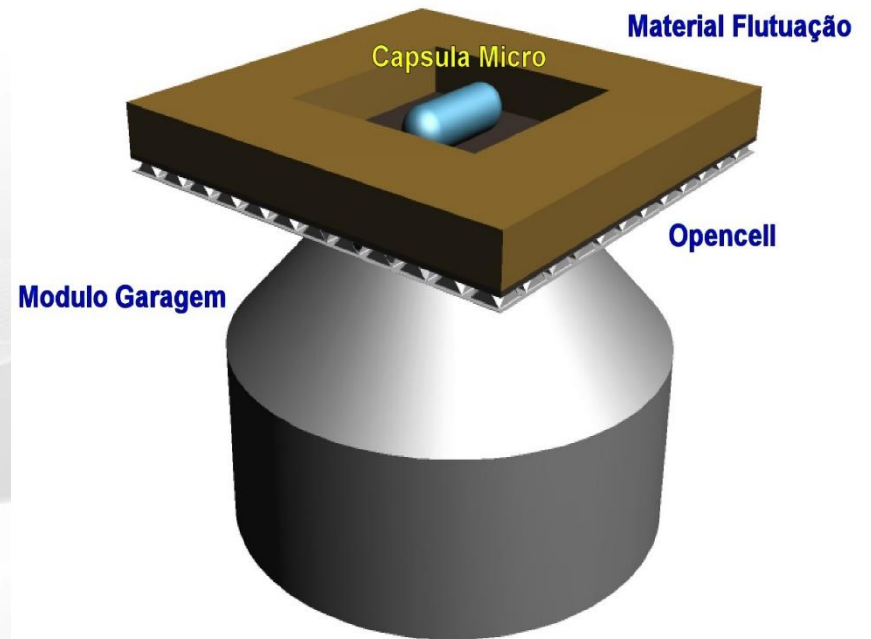
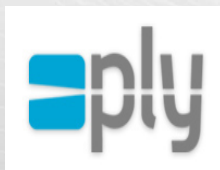
Primeiros exercícios do CINAV com um glider

Utilização extensiva do veleiro autónomo





## Plataformas autónomas para permanência no leito do oceano



# Maritime Situational Awareness (Decision Support Systems research line)

Strategic research area for future naval operations

Develop know-how in support of operational needs

**BlueEye, Overseer 2** - Overseer MSA software in operation use at MRCC

**MASSGP** - GP for predicting trajectories in Overseer

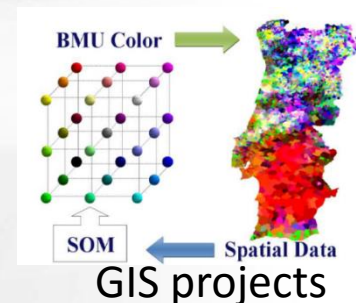
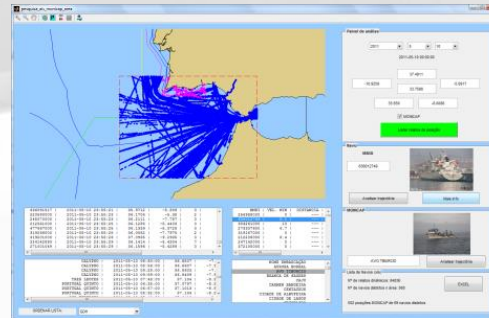
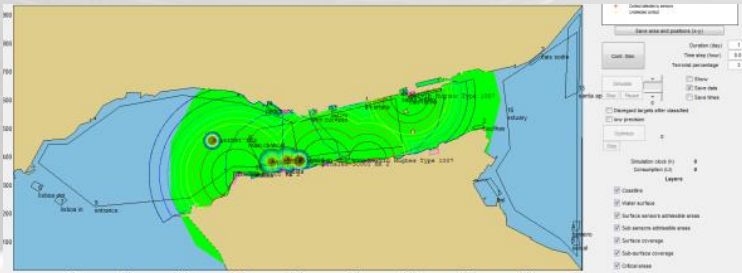
**SeaGull** - Use of UAV in Overseer

**SADAP, AISIntel** - Fishery Control operations, Intelligence from AIS

**SafePort**, Harbor Protection DAT-POW - Nato Initiatives

**Mission Planning** -UUV/USV planning for minewarfare

**EUCISE2020**- Information Sharing in the Maritime domain



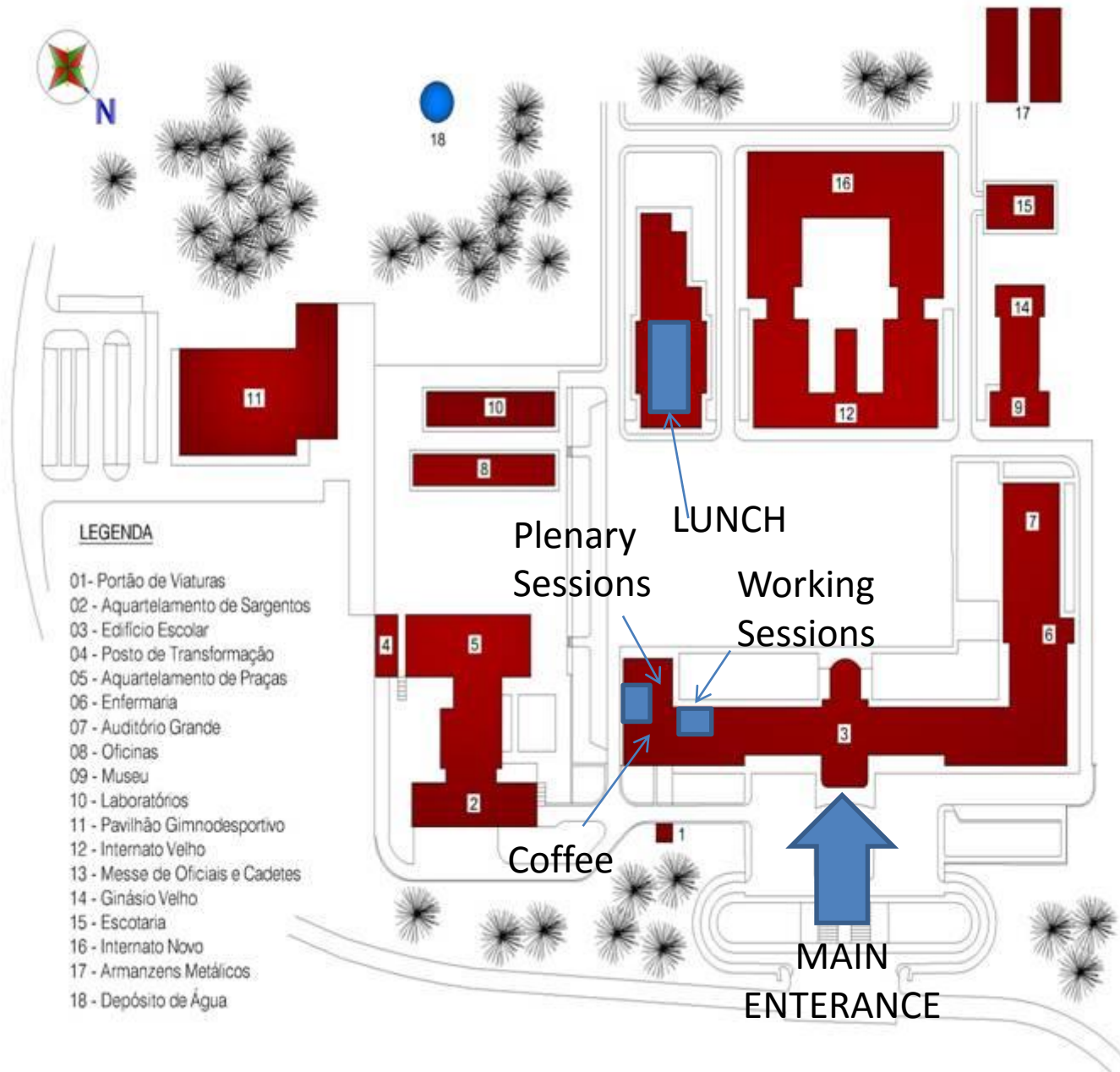
**Talant de bien faire**



**Research and Development  
in search of excellence  
with Universities and Industry**

**Fulfilling the Navy's Mission  
in the service of our Nation**





## Internet Access

You have passwords and must use the proxy

## Coffee Breaks and Lunch

Short visit to the Naval Academy and group PHOTO !  
tbd...

## Conference Dinner

Tuesday, Officers's Club in Lisbon (the bus leaves at 19:00)

**Talant de bien faire**



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