

# Robots aéreos y sistemas no tripulados para detección, seguimiento e intervención

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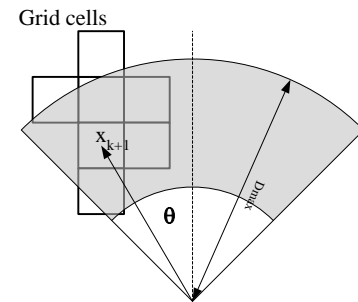
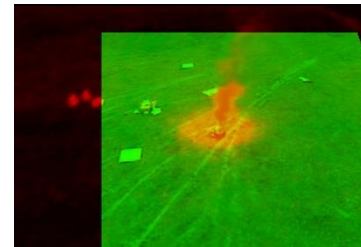
Asesor Científico de FADA-CATEC

Robótica y Sistemas No Tripulados para  
Aplicaciones de Seguridad

**More than 15 years on autonomous UAV detection and monitoring**  
<http://grvc.us.es/comets>

**EUROPEAN COMMISSION. IST PROGRAMME, 2001- 34304, 2002-2005.**

- **Multi-UAV cooperation**
- **Control and FDI techniques,**
- **Cooperative detection and monitoring**



Implementation with autonomous helicopters and airships  
 Heterogeneity and complementarities:

Airship: panoramic view, communication

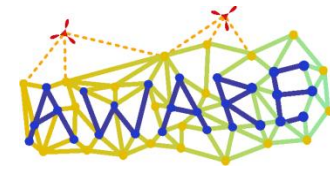
Helicopters: manoeuvrability, hovering, detailed views,

Forest fire detection and monitoring experiments.

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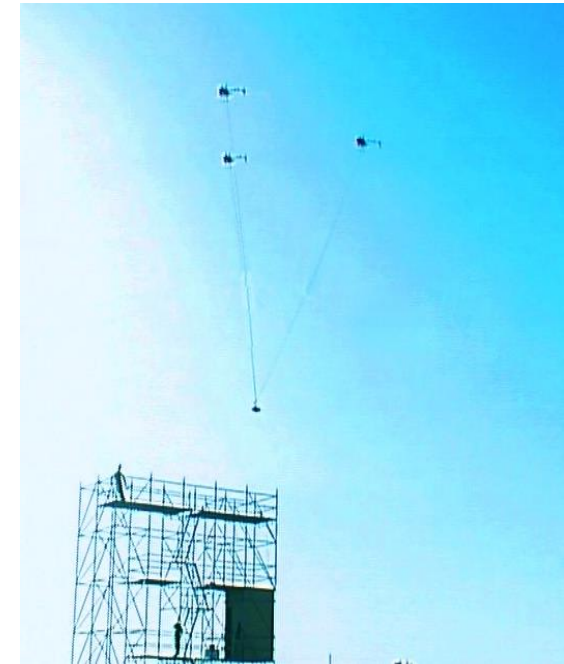
Madrid, 2 de Diciembre de 2016



**Cooperation of autonomous helicopters,  
with a ground sensor-actuator wireless  
networks**

**Network self deployment in sites without  
communication infrastructure.**

- Multi-UAV joint load transportation
- Distributed estimation
- Distributed planning and task allocation
- New UAV developments
- Middleware for UAS and WSN integration



## Safety, accuracy and scalability in multi-UAS systems

### Methods:

- Distributed estimation
- Distributed decision and control
- Safe and secure architecture

### Validation:

- Landing on mobile platforms
- UAV deployment from aircrafts
- Tracking for surveillance applications



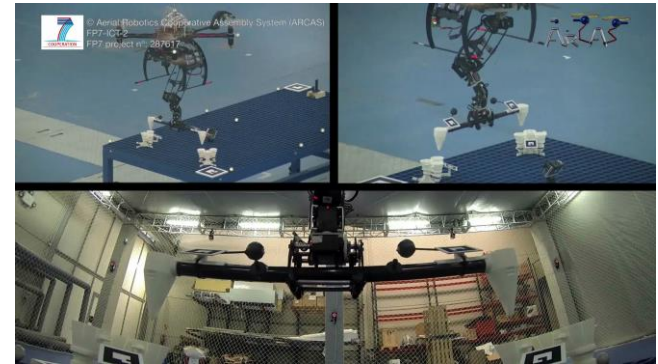


# ARCAS Aerial Robotics Cooperative Aerial System FP7 ICT 287617, 2011-2015)



<http://www.arcas-project.eu/>

Cooperative flying robot system for assembly and structure construction.



mañana, 2 de Diciembre de 2016

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# H2020 MARINE UAS

- Distributed approaches for coverage and tracking missions with multiple heterogeneous UAVs for coastal areas
- Multi-UAS planning and trajectory generation for safe long duration missions

Application: UAS technologies for maritime and coastal surveillance



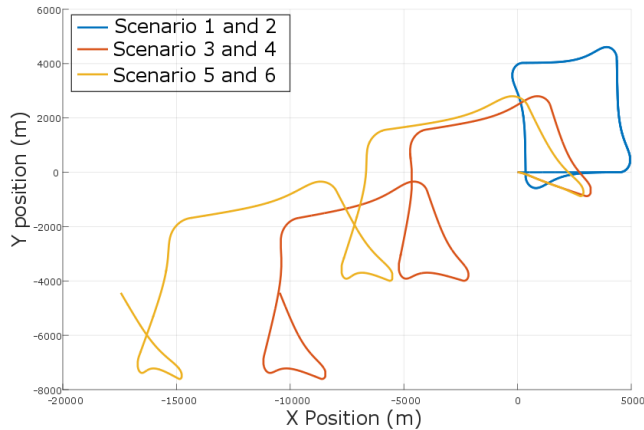
# Marine UAS conditions

- Trajectory optimization to increase flight endurance
- Payload and battery constraints
- Constraints due to regulations.

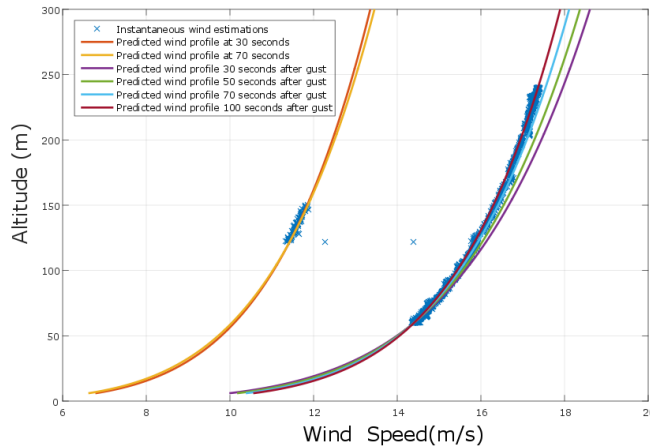




# Simulations and Experiments



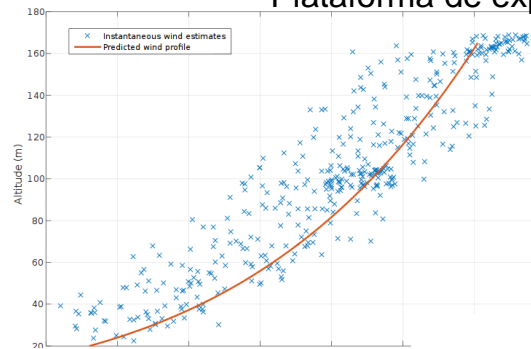
Simulation of wind effects



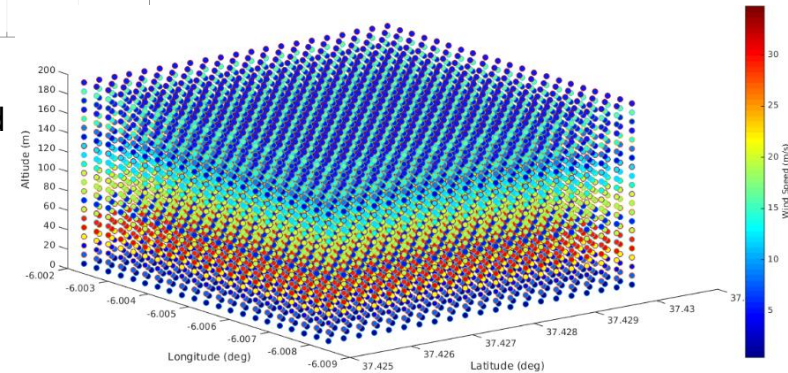
Identification of wind gust and shear



Plataforma de experimentos y trayectoria



Generation of 3D wind maps



Wind shear characterization  
Wind vector prediction

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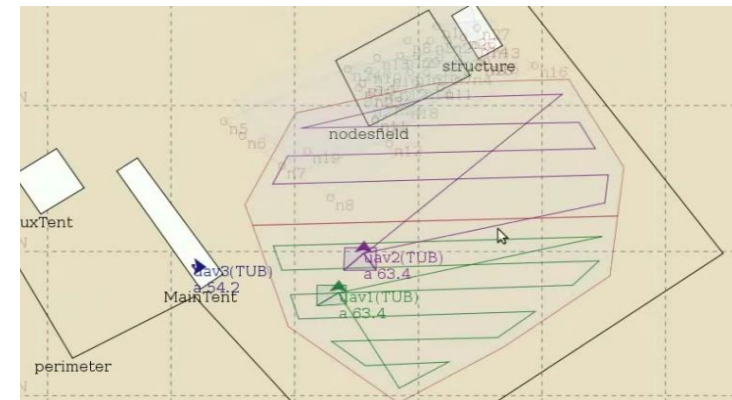
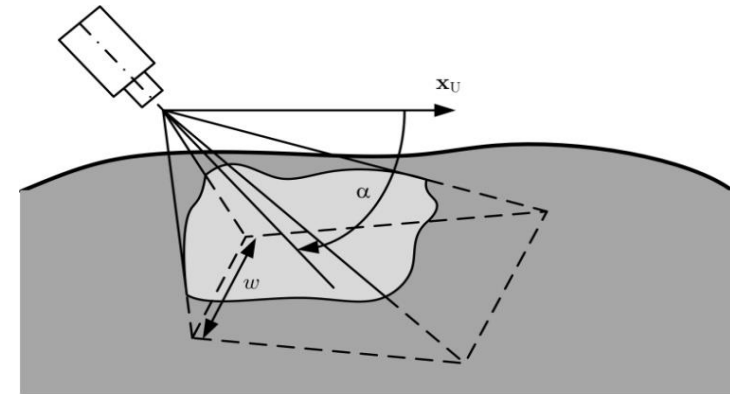


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# MarineUAS: Multi-UAV area partition

- Goal: To cover a convex area with one or several UAVs
- Problems to solve
  - 1. Area partition
    - Input: relative capabilities (distributed computation) and locations of the UAVs
    - Output: sub-areas allocated to the UAVs
  - 2. Pattern to cover each sub-area
    - Input: sub-area to be covered
    - Output: waypoint list for each UAV
    - Criteria: minimize the number of required turns



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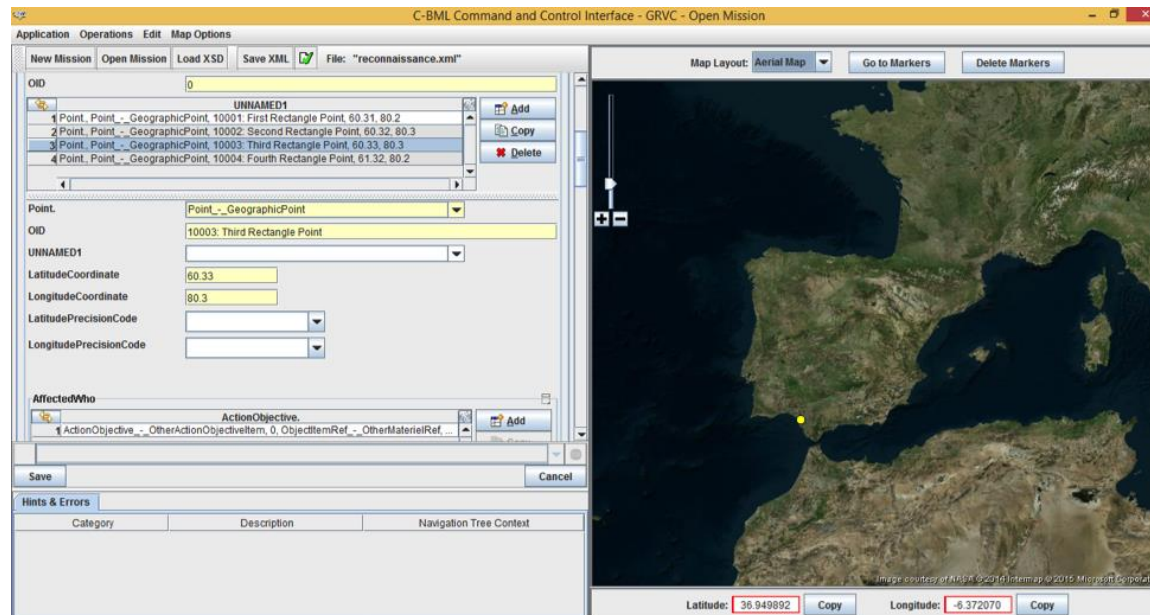
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# CITIUS: C-BML mission editor

- Graphical user interface has been developed for the management of missions specified in the C-BML language
  - Software has been tested with the C-BML files of four missions of interest defined in the previous period of the project: search and rescue, mine hunting, reconnaissance and surveillance



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# CONCLUSIONES

- More than 15 years of expertise in UAV detection, monitoring and surveillance technologies
- New technologies
  - Aerial Manipulation
  - Long endurance flights
  - Multi-UAV cooperation
  - Integration with UGVs and USV
  - Integration with wireless sensor and actuator networks
- Applications in cooperation with companies and end-users