SkyEye Project Update for TFRSAC

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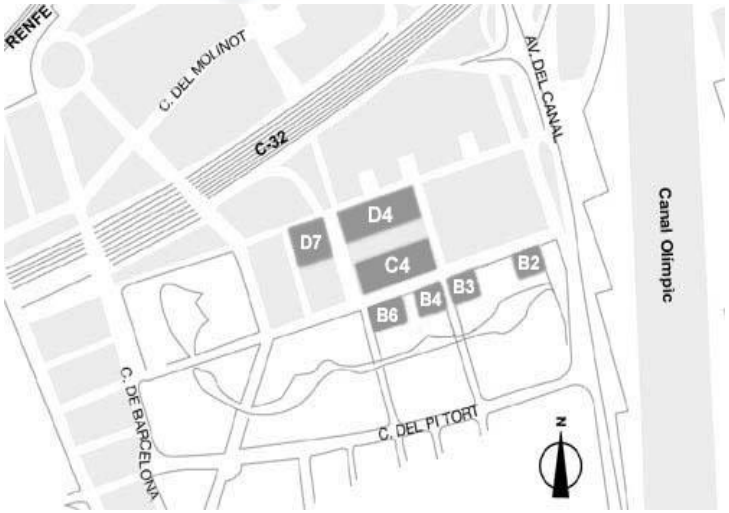
ICARUS Group Presentation

- Technical University of Catalonia
  - 15 schools, 40 departments, 30.000 students, 2.500 researchers
- Escola Politècnica Superior de Castelldefels
  - 4 degrees: telecomunicacions and aeronautics, 3.000 students, 15 research groups, inside the Parc Mediterrani de la Tecnologia



ICARUS Group Presentation

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- ICARUS: Intelligent Communications and Avionics for Robust Unmanned aerial Systems
  - 11 researchers (4 Ph.D.), multidisciplinar group
- Computer Science
  - Web services
  - Embeded systems
  - SIG
  - Formal methods
- Telecomunicacions
  - Wireless communications: WiFi, WiMax, RC, Satellite
  - Hardware design
- Aeronautics
  - Aeronavigation procedures
  - ATM

Our UAS Strategy

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- Flexible UAS operation will be possible by:
  - Link flight-plan with payload: global mission concept
  - Having a flexible mission/payload control
  - Mission reconfiguration can be achieved in short time
- Methodology:
  - Exploit information technology concepts and methods
  - Pragmatic view: structure applications rather than using Artificial Intelligence

Sky-Eye development platform

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Automation key for productivity

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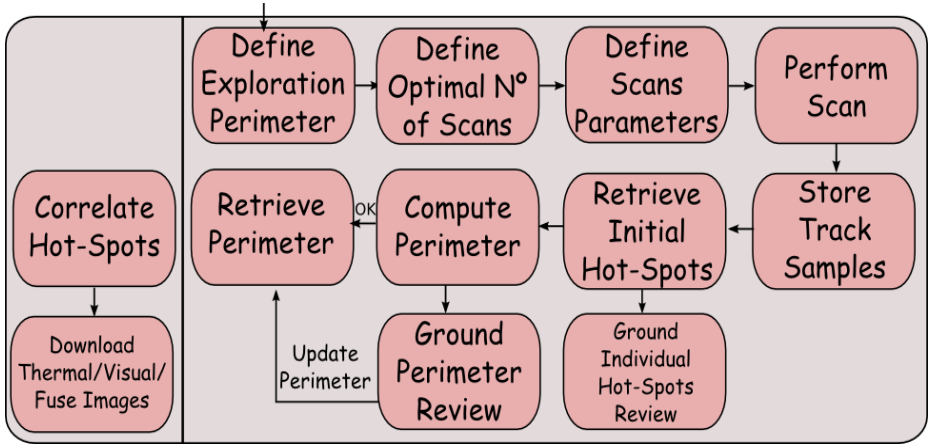

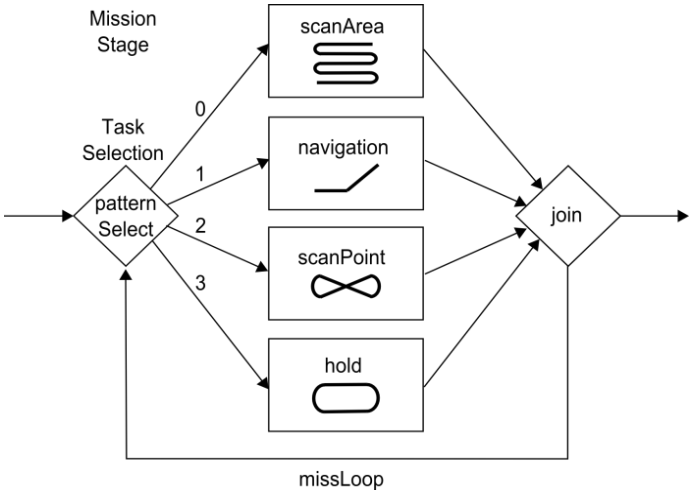

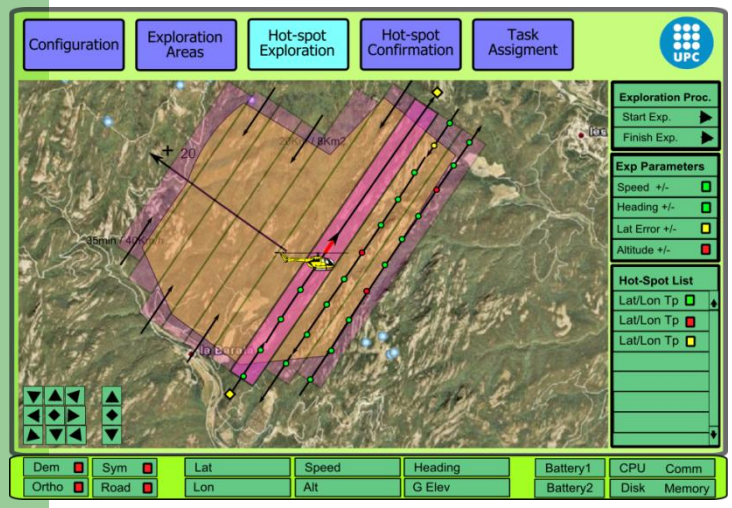

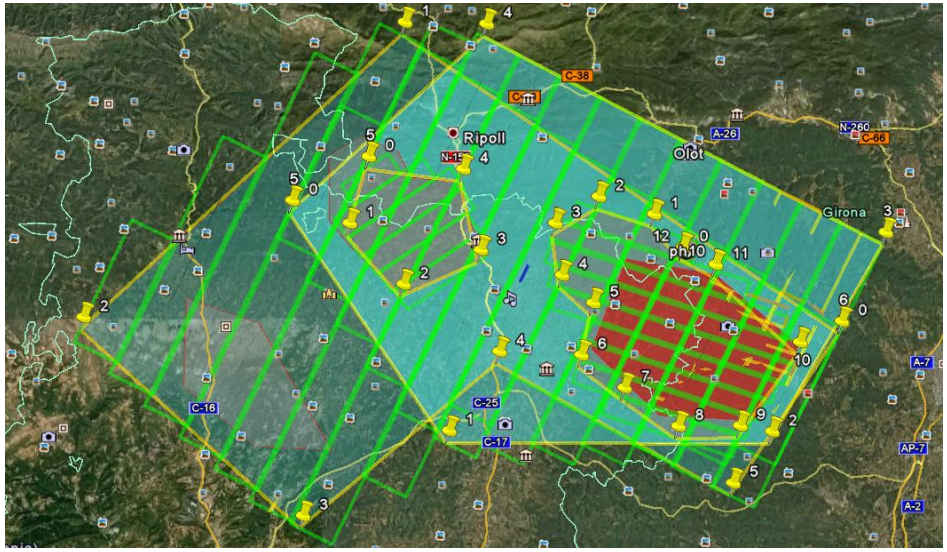

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Automation key for productivity

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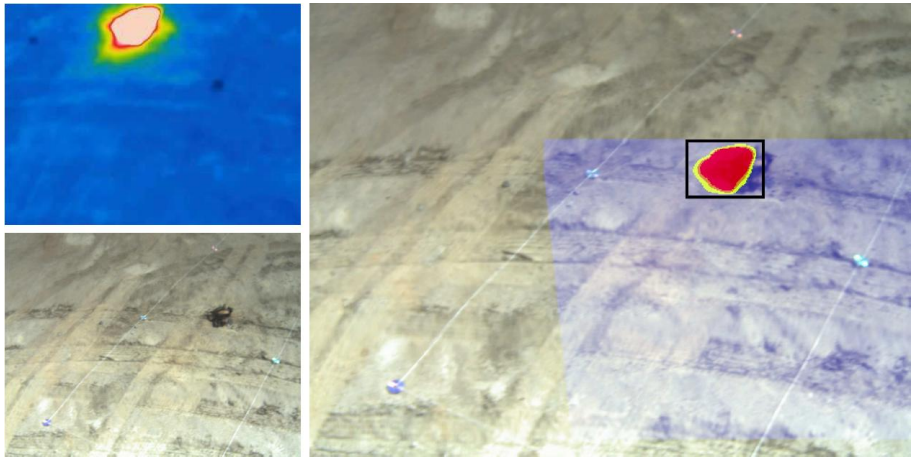

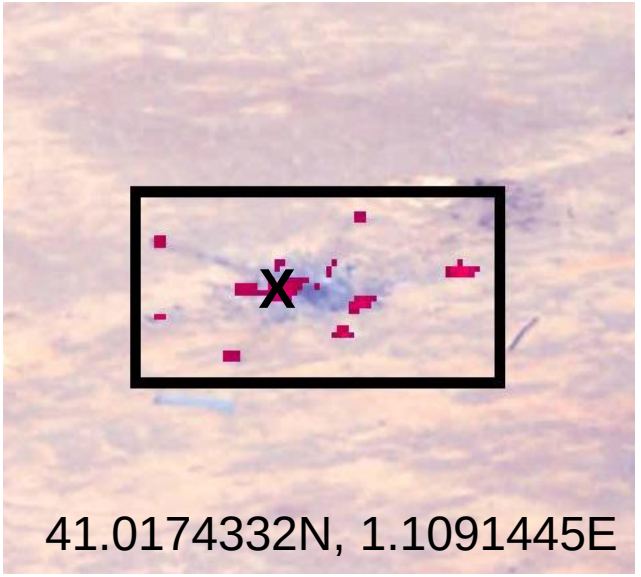

Review of activity

- UAV Platform integration
- Automated support for operations
- IPM: on-board flexible computation
- Small failures

UAV Platform integration

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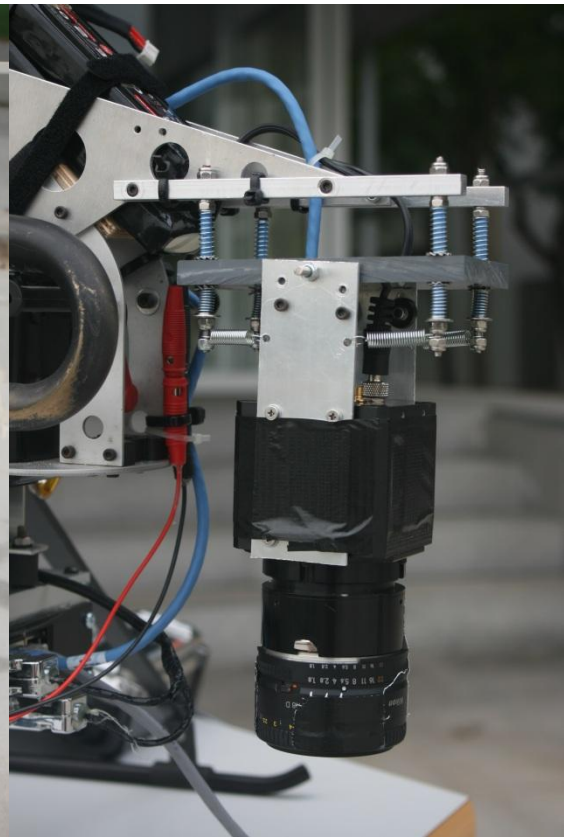
- Improved platform integration (weight & vibrations):



UAV Platform integration

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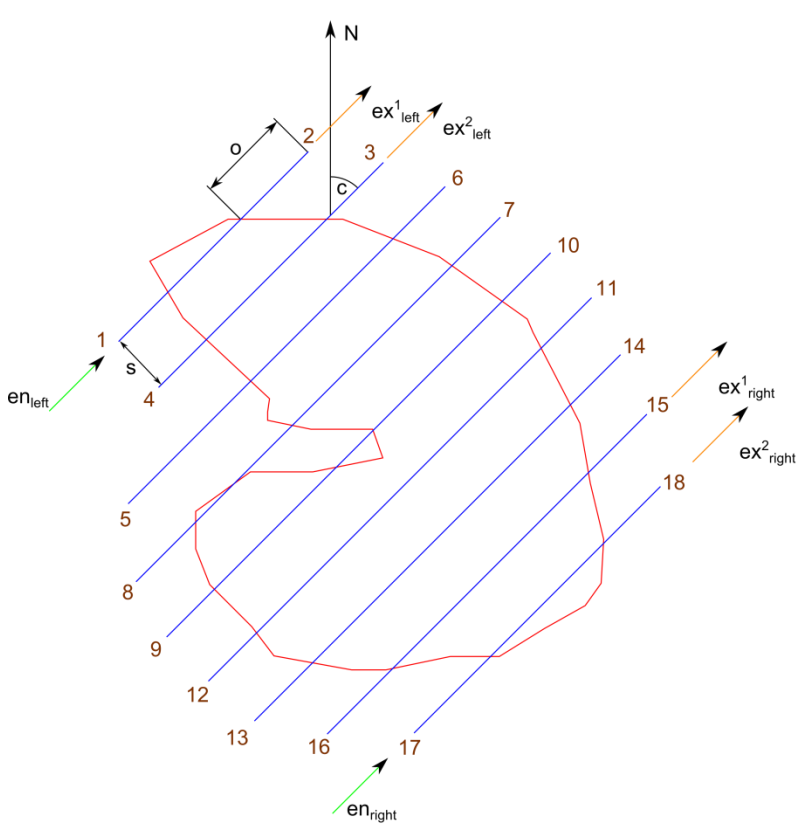
- Fully autonomous platform under integration:

Automated support for operations

- Automation of scanning / perimeter analysis:



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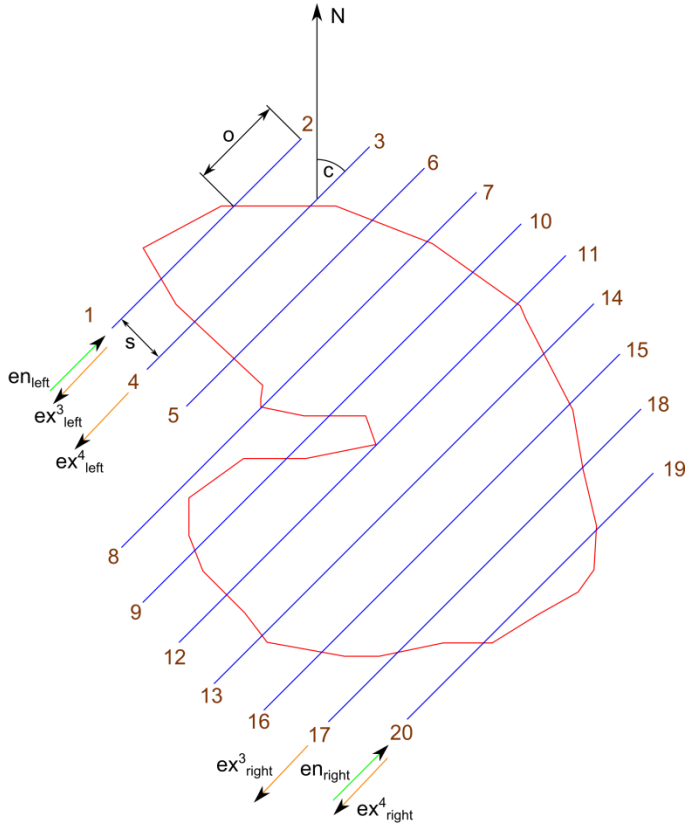

b)

Automated support for operations

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- Parameter-based flight plan definition.
- Dynamic update capabilities.

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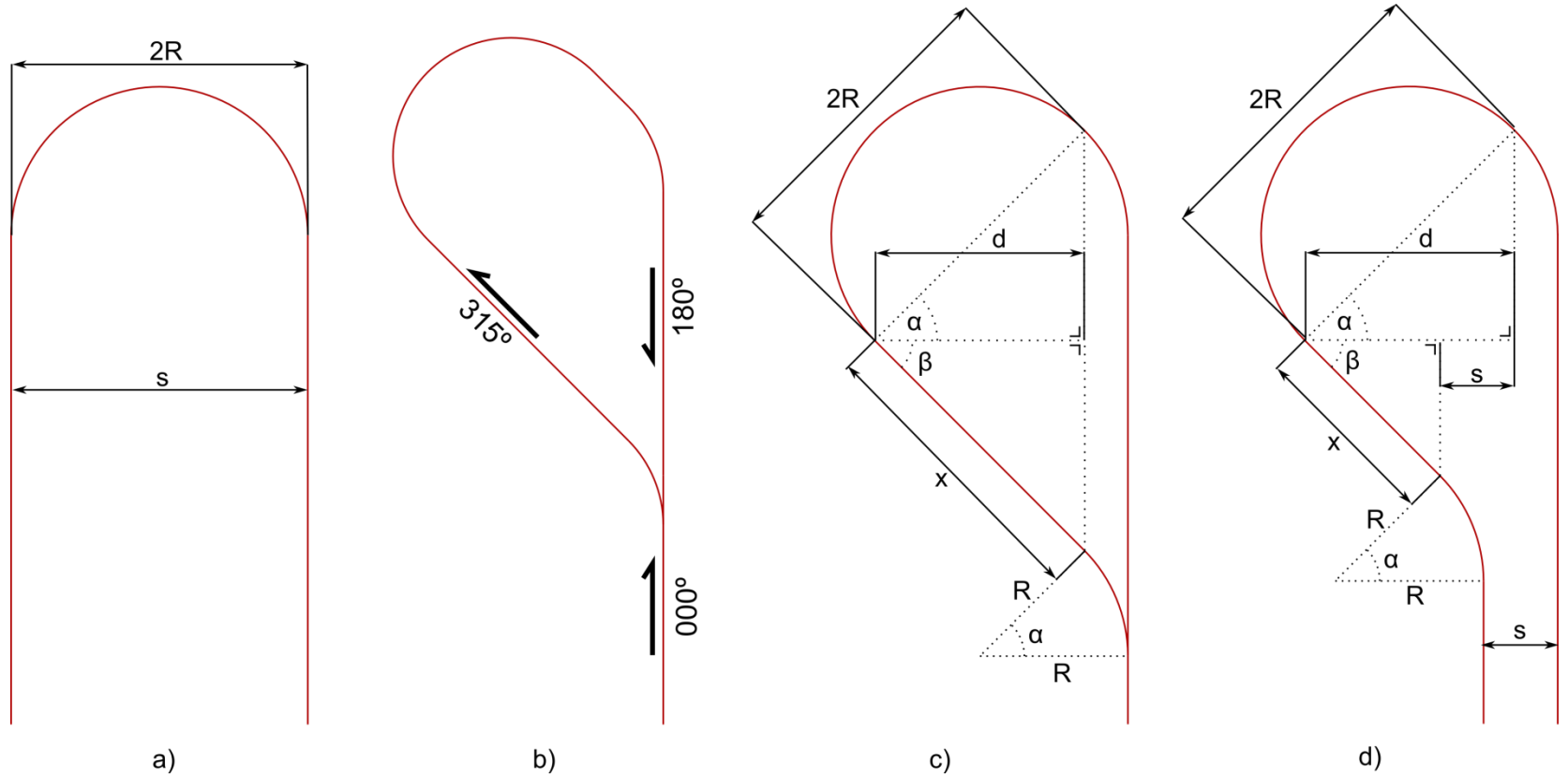
Automated support for operations

- Turn design.



Automated support for operations

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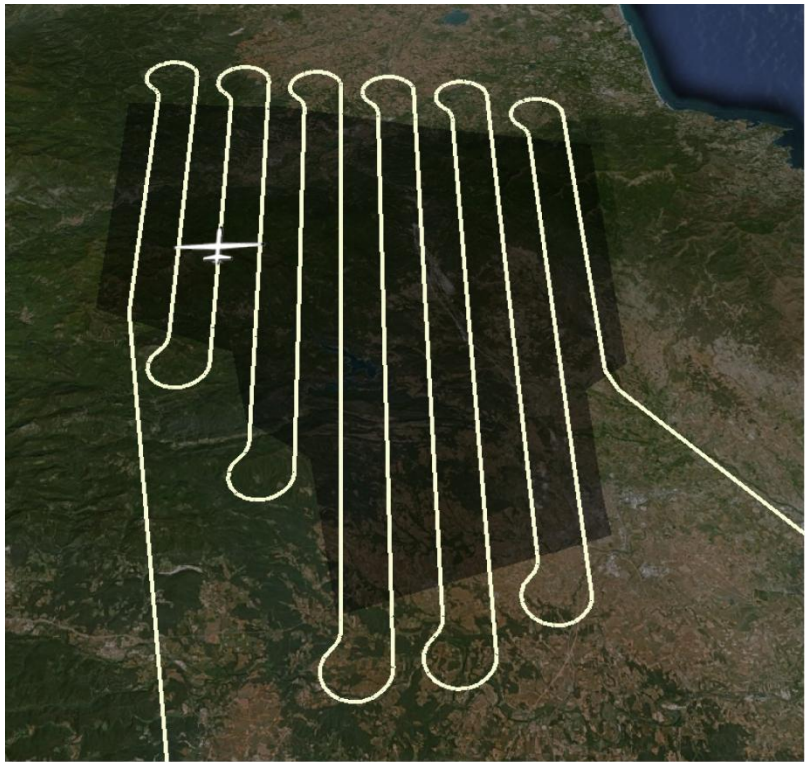
- Simulation results.



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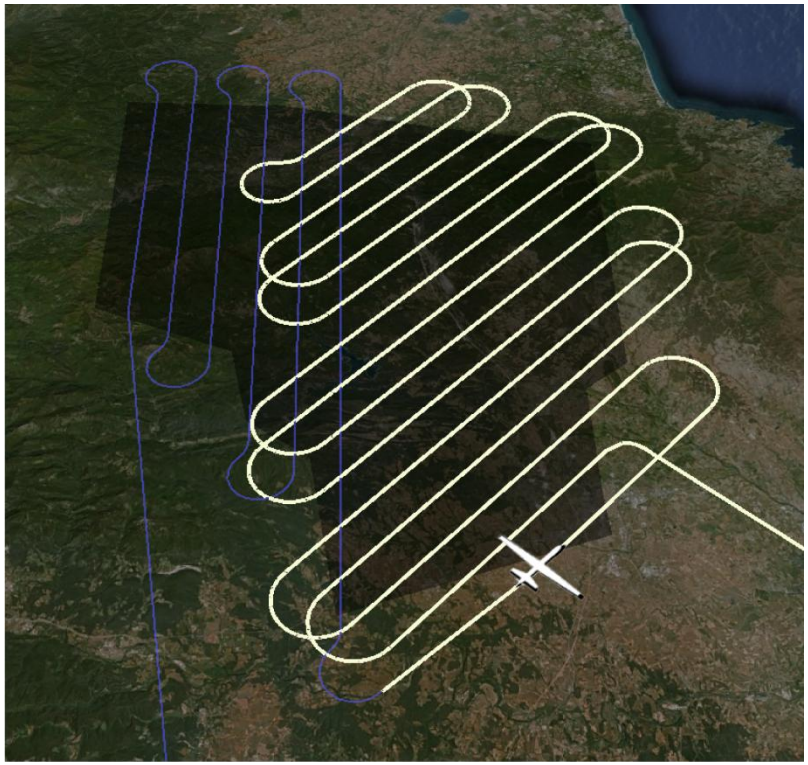

b)

IPM: on-board flexible computation

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Technical objectives:

- Employ UAS based missions to verify real-time operability of small surveillance platforms via the use of **on-board multicore processor technology (IPM)**.
- Demonstrate IPM integration feasibility on highly integrated and physically constrained systems.
- Demonstrate the UAS flight-plan / mission management interaction with the IPM architecture to exploit sensor data on-board the UAS.
- Permit high-level of surveillance dynamics and flexibility according to the actual stream of data being sensed.

IPM: on-board flexible computation

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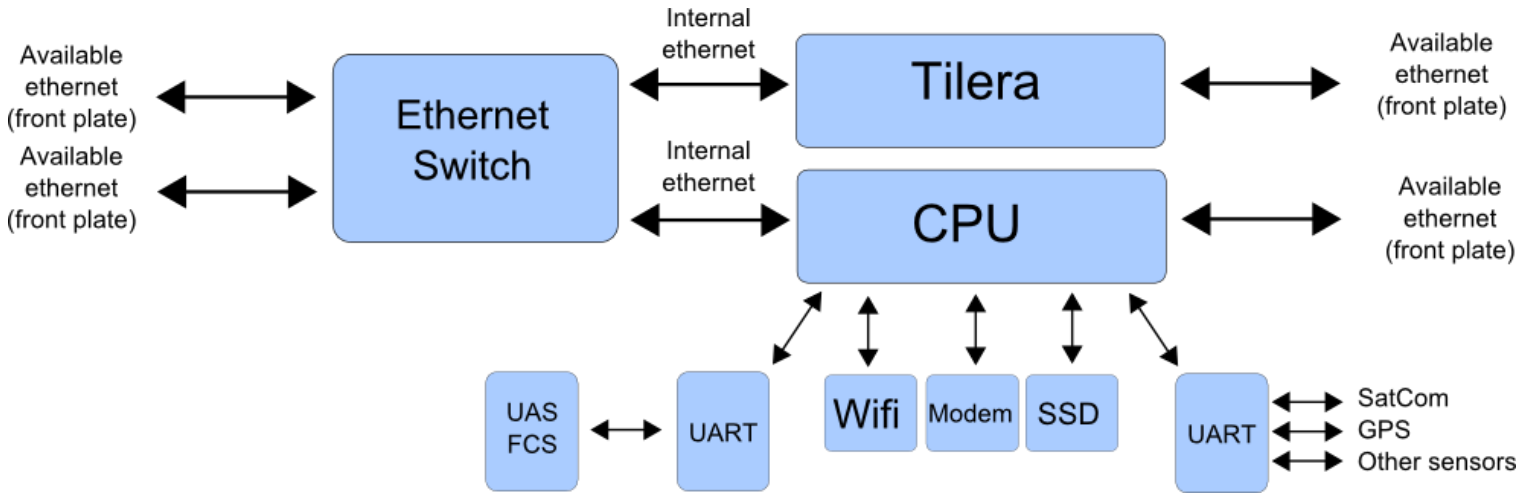
Strategy:

- Configure multiple levels of surveillance automation and operation phases by exploiting IPM computational reconfiguration and Power/CPU tradeoffs.
- Generate real-time operational commands through UAS mission subsystems and reconfigure IPM according to the mission phase requirements.



IPM: on-board flexible computation

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Mission:

- In collaboration with CSIC science requirements, design a **jellyfish detection, identification and classification system**.
- **Invasive jellyfish species** are appearing in one of the biggest river deltas in Spain. Expected to greatly affect the existing ecosystem.
- Monitor distribution of the population and dynamic evolution along the season. Identify and catalog the specific jellyfish types.
- Two phase surveillance procedure:
  1. Medium altitude / high speed overfly of the area for detection of population presence. Real-time analysis based the IPM box.
  2. Low altitude / low speed overfly to achieve identification and classification of species.
- Both phases are executed in the same flight. Second phase is executed based on data processed in the first.
- IPM box will provide location of population, identification and distribution maps through web-services directly provided from the helicopter.

IPM: on-board flexible computation

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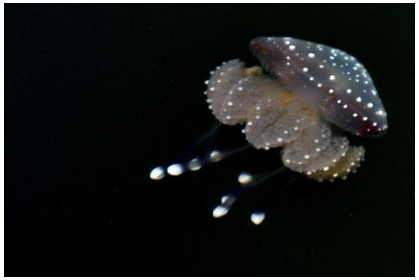

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IPM: on-board flexible computation

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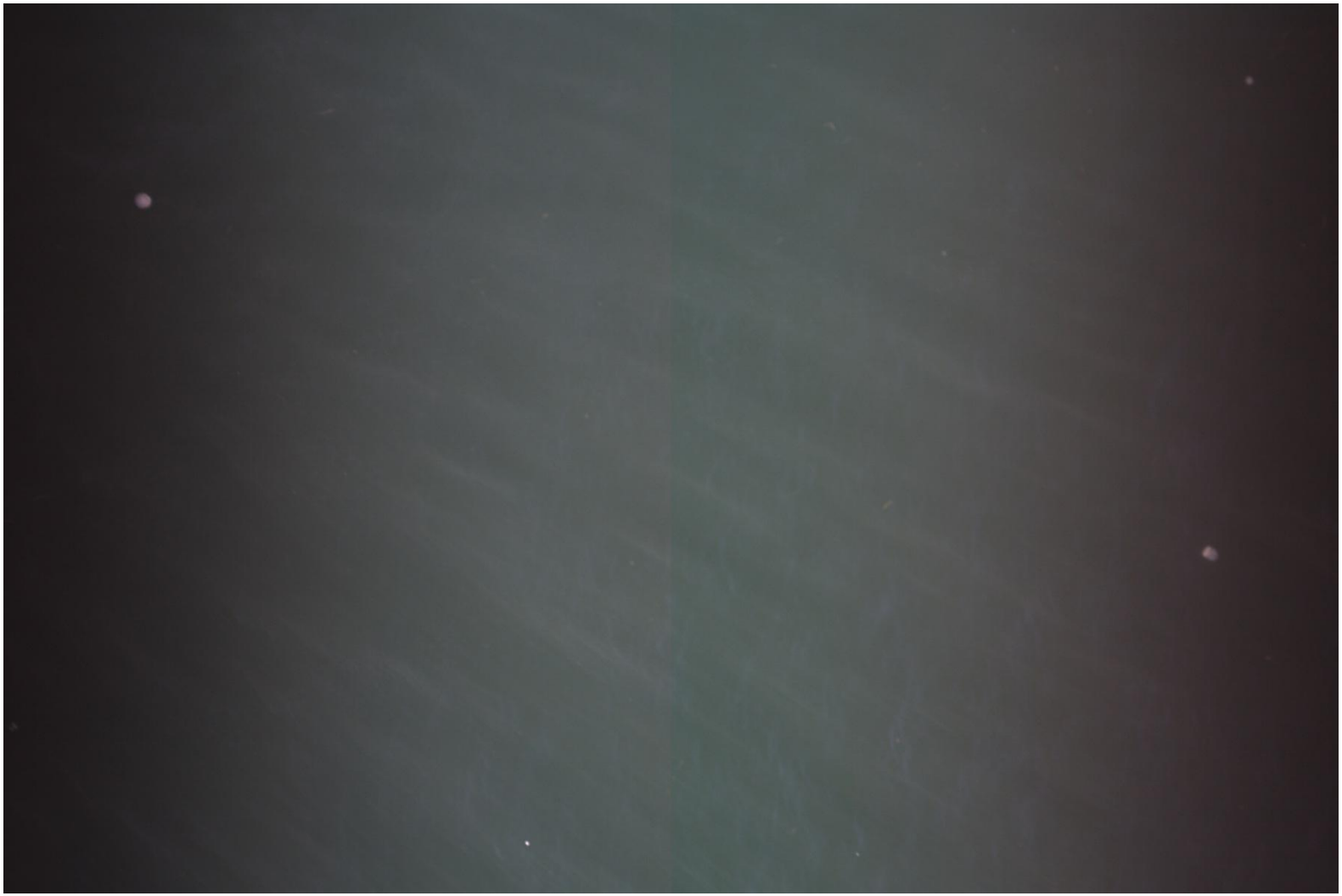

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Thanks for your attention!

Questions?