Intelligent Payload Module Concept Evolution

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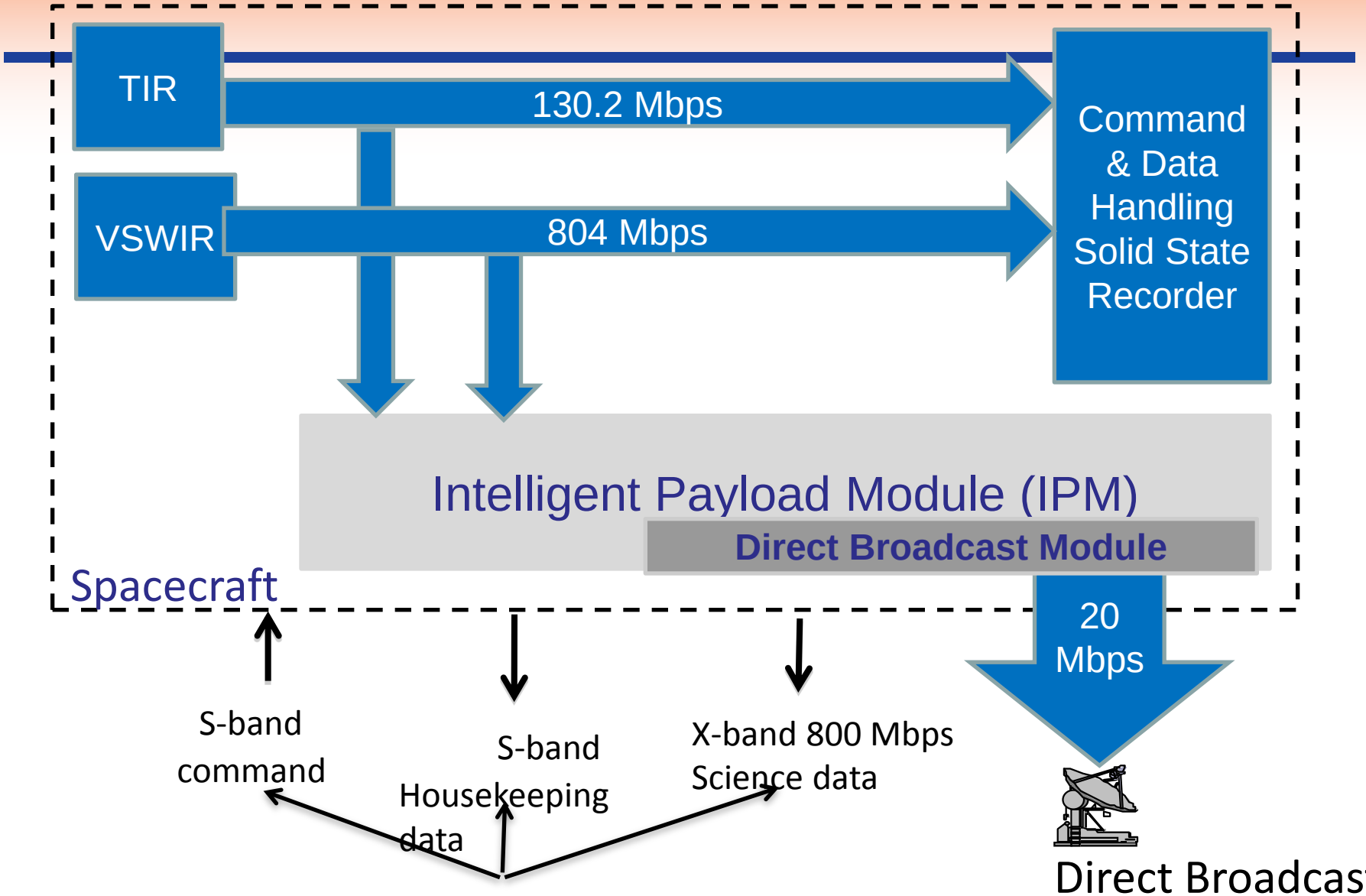
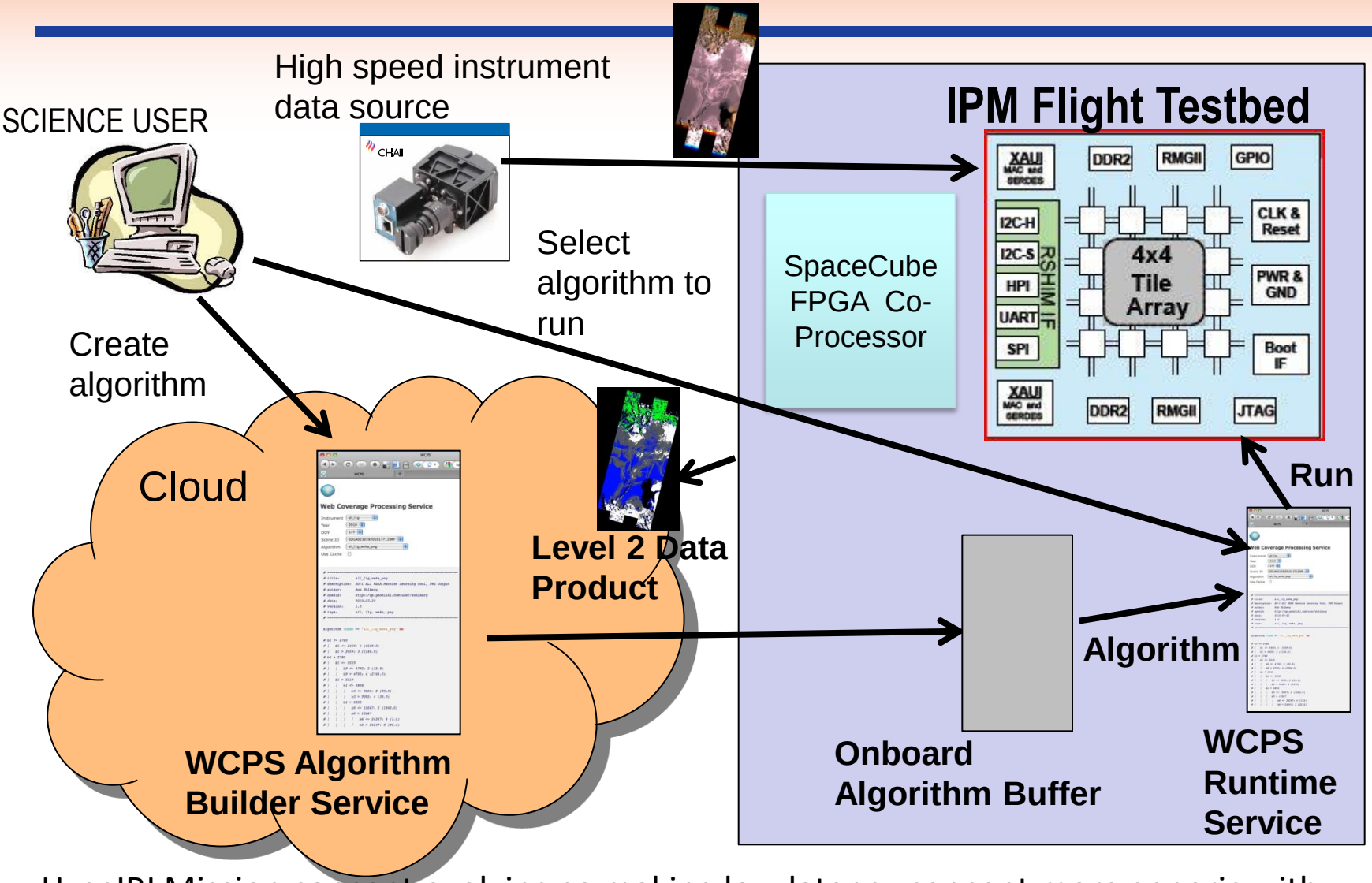
HyspIRI Symposium
Intelligent Payload Module Session
June 5, 2014

Original HyspIRI Low Latency Data Flow Operations Concept (Intelligent Payload Module)



Revised Low Latency Ops Concept



HyspIRI Mission concept evolving so making low latency concept more generic with some combination of ground cloud computing and onboard multicore processor.

Broad Range of Supported Platforms

USFS King Air B200

Contract MD 500C

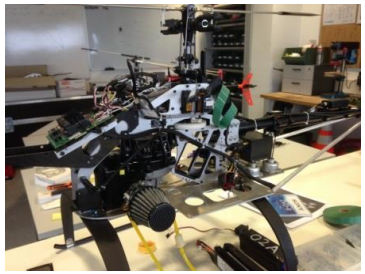
ISS Optical Window

USFS Cessna Citation

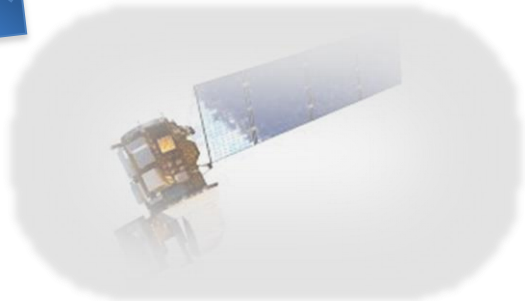
Intelligent Payload Module

HysplRI

NASA Cessna 206H



Rotorcraft Drone



Landsat 9

Typical Science Algorithms

- Low latency users access data products via onboard Web Coverage Processing Service (WCPS) which allows specifying algorithms in real time and rapid access of resultant products
  - Spectral Angle Mapper image classification;
  - Regression Tree image classification;
  - Vegetation dynamics;
  - Water quality;
  - Burned area;
  - Flooded area;
  - Habitat fragmentation; and
  - Stretch goals like plume detection.

Exercising the Technology

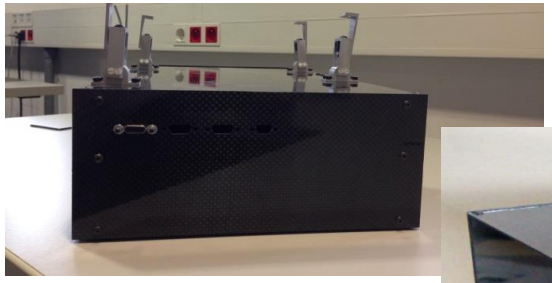
- Use sub-orbital platforms to demonstrate the IPM architecture in real world situations;
- Employ computationally demanding algorithms in real time;
- Evaluate new processors and compilers;
- Pass data products to users via com links of reduced bandwidth;
- Coordinate collects among multiple assets;
- Engage with next generation design efforts for missions such as an ISS spectrometer, HyspIRI and Landsat 9 mission formulation.

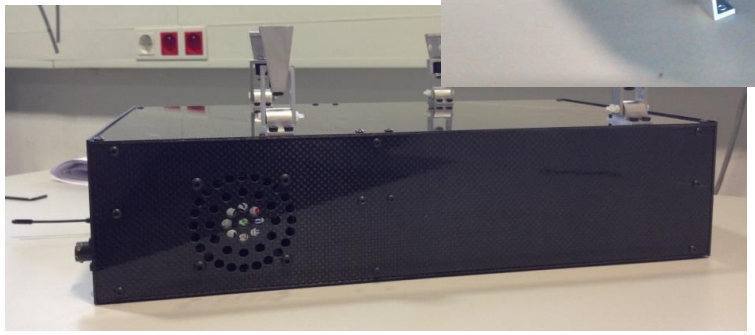
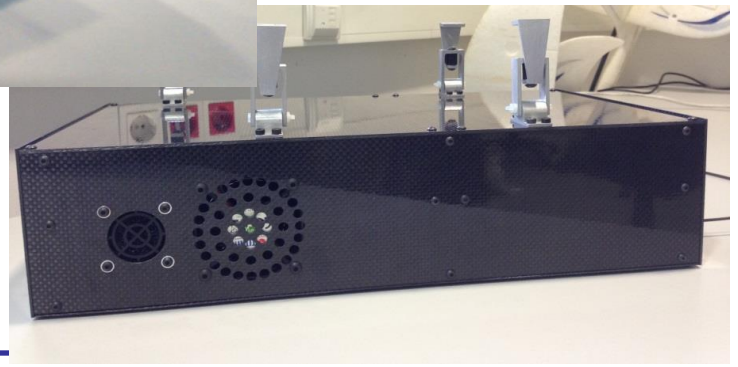
Key Methods to Accelerate Onboard Computing for a Space Environment

- Intelligent onboard data reduction
- Parallel processing, multicore processors
- Use of FPGA as co-processor to accelerate portion of algorithms

Compact IPM Box for UAS Operations

- Modified version of IPM to install on an mini-UAV helicopter integrated by Enric Pastor of Univ. of Catalunya (co-investigator)



Demonstration: University of Catalunya UAV Mini-helicopter

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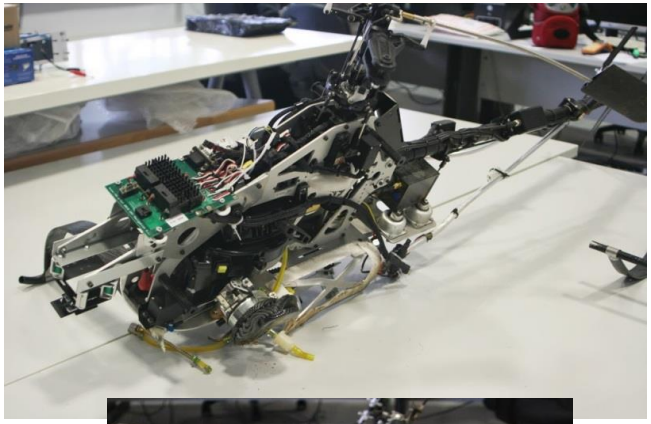
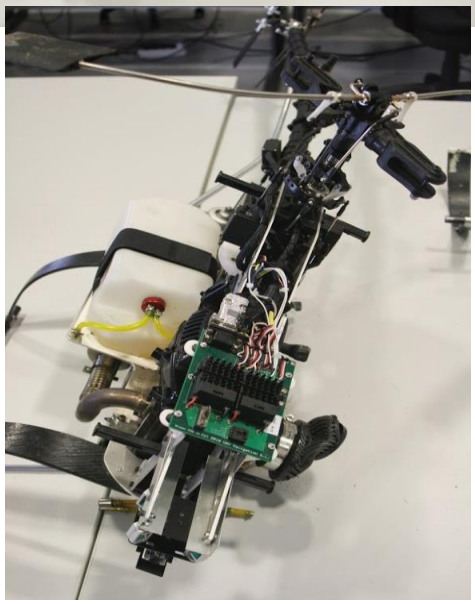
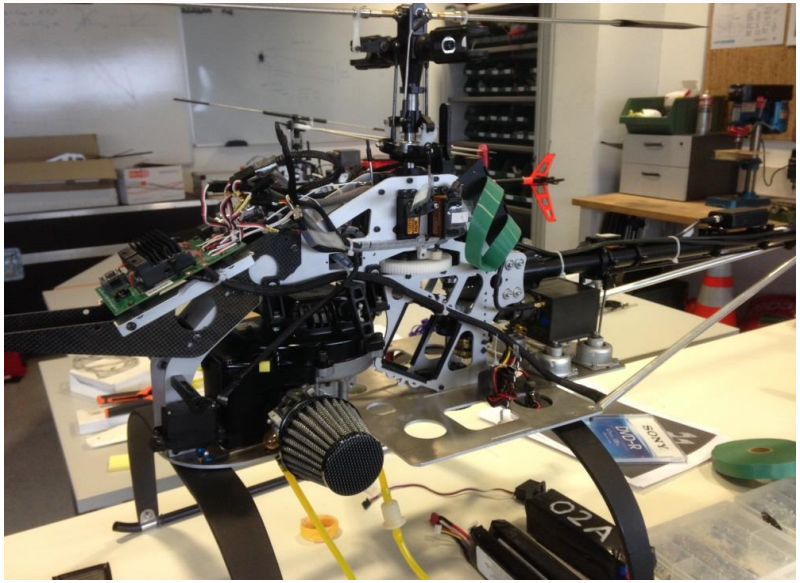
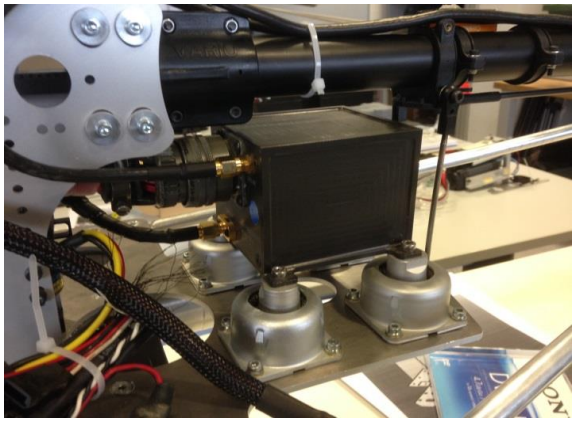
UAS Jellyfish Monitoring Mission Autonomous Helicopter with Onboard IPM Computation



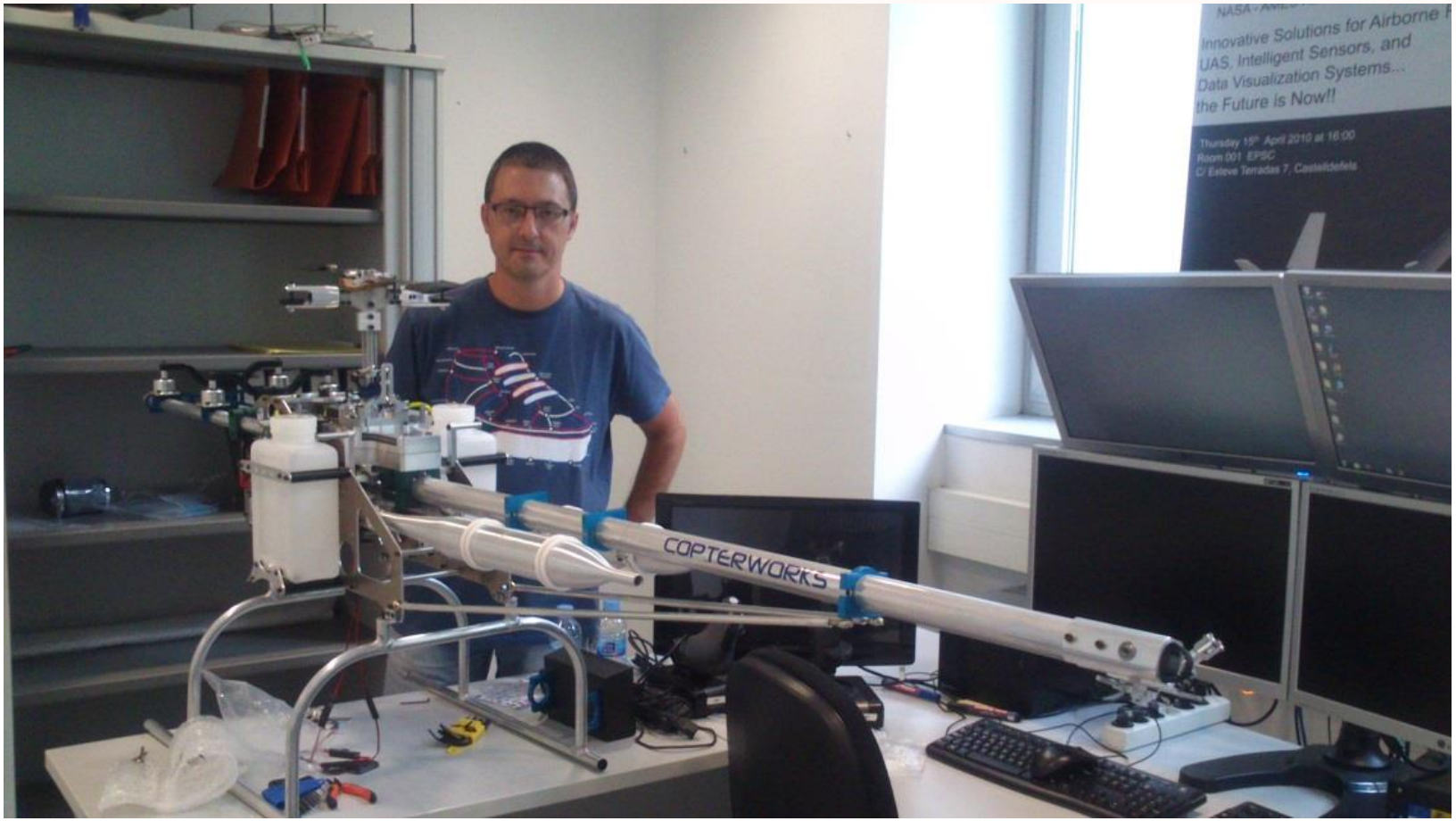






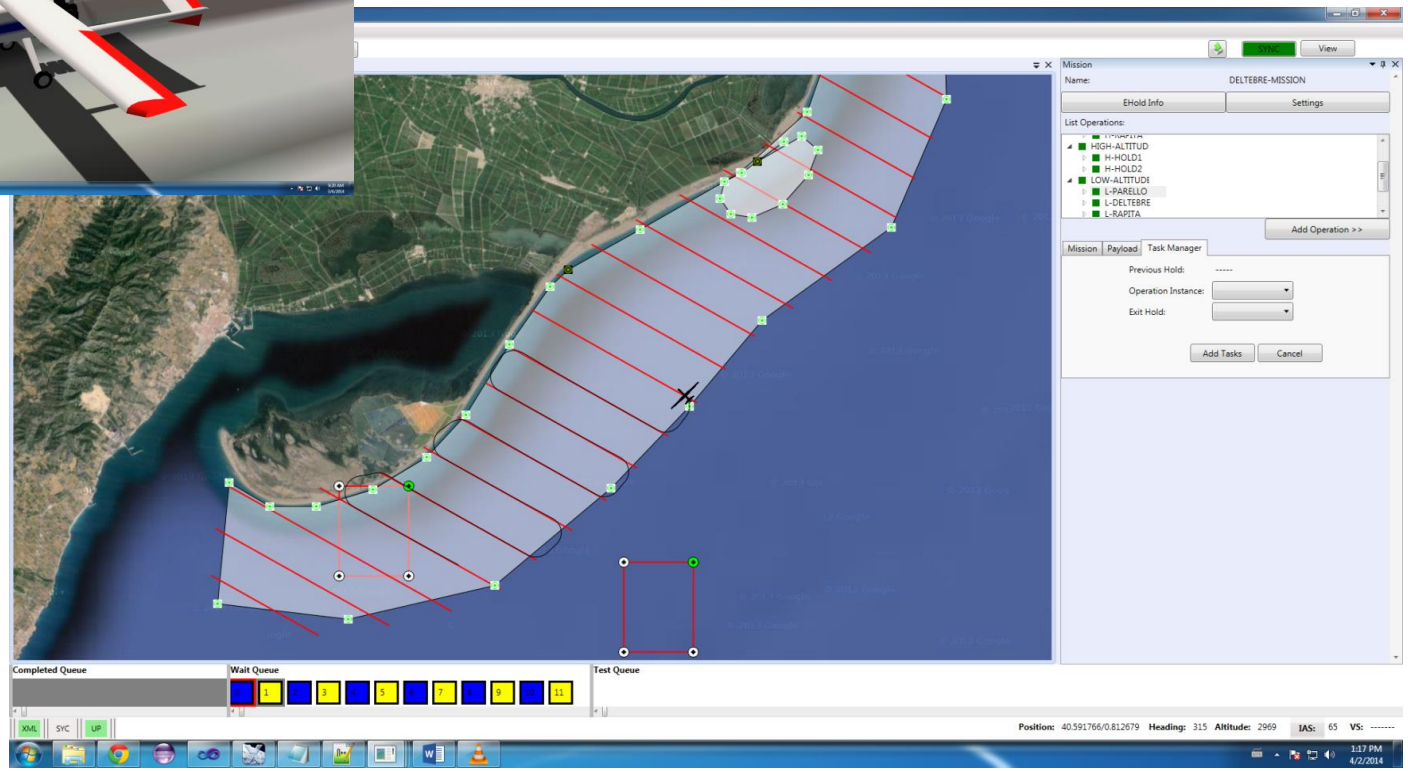
Demonstration: University of Catalunya UAV Mini-helicopter

Larger UAS Helicopter Being Set Up



Demonstration: University of Catalunya UAV Mini-helicopter

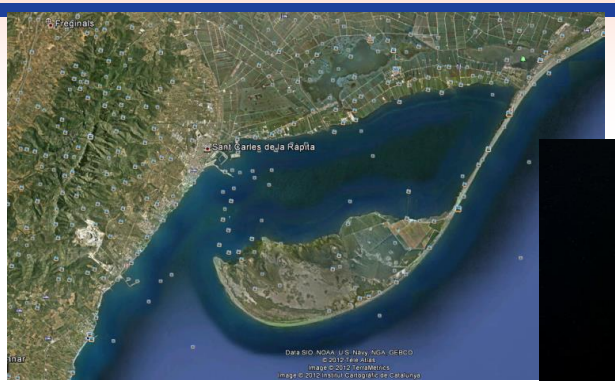
Simulation Scenario with Sierra UAS



- https://www.youtube.com/watch?v=aFXdxjX1DDo&feature=youtu.be

Demonstration: University of Catalunya UAV Mini-helicopter

Unmanned Aerial System Jellyfish Monitoring Mission with IPM (Univ. of Catalunya)



Area of interest: Delta del Ebre south of Barcelona. Multiple Australian jellyfish being increasingly detected.

First test mission: Late summer 2012

Initial low-altitude mid-altitude images successfully acquired.

Demonstration mission with IPM (containing Tilera processor) summer 2014

http://www.youtube.com/watch?v=Uam7-thvM80

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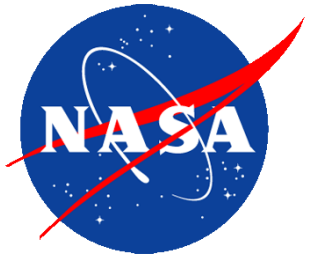
NASA