

# M3 Systems - Portfolio of Earth observation solutions and R&D



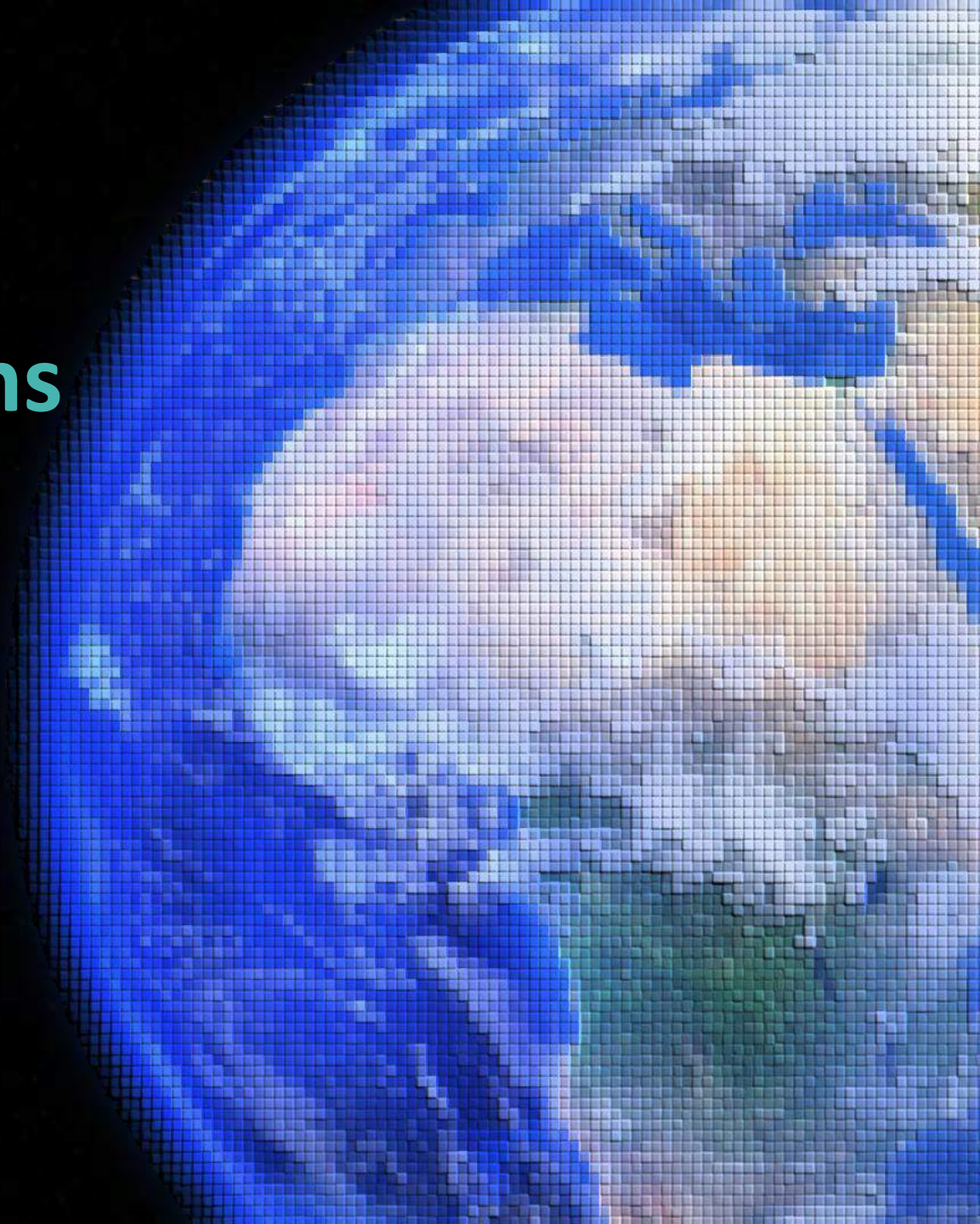
GTEO – 18/04/2023

Benjamin QUEVAL – Project Engineer



**GROUPE  
MISTRAL**

CONCEPTS  
POSITIONING  
PRODUCTS



# Agenda

## ► Who we are

## ► Our solutions, application and R&D

- GNSS Reflectometry by drone
- Forest and Sea Surveillance by drone
- Observation to support Search and Rescue (HASARDS)

# Mistral Group

More than 20 years of expertise for critical and autonomous systems



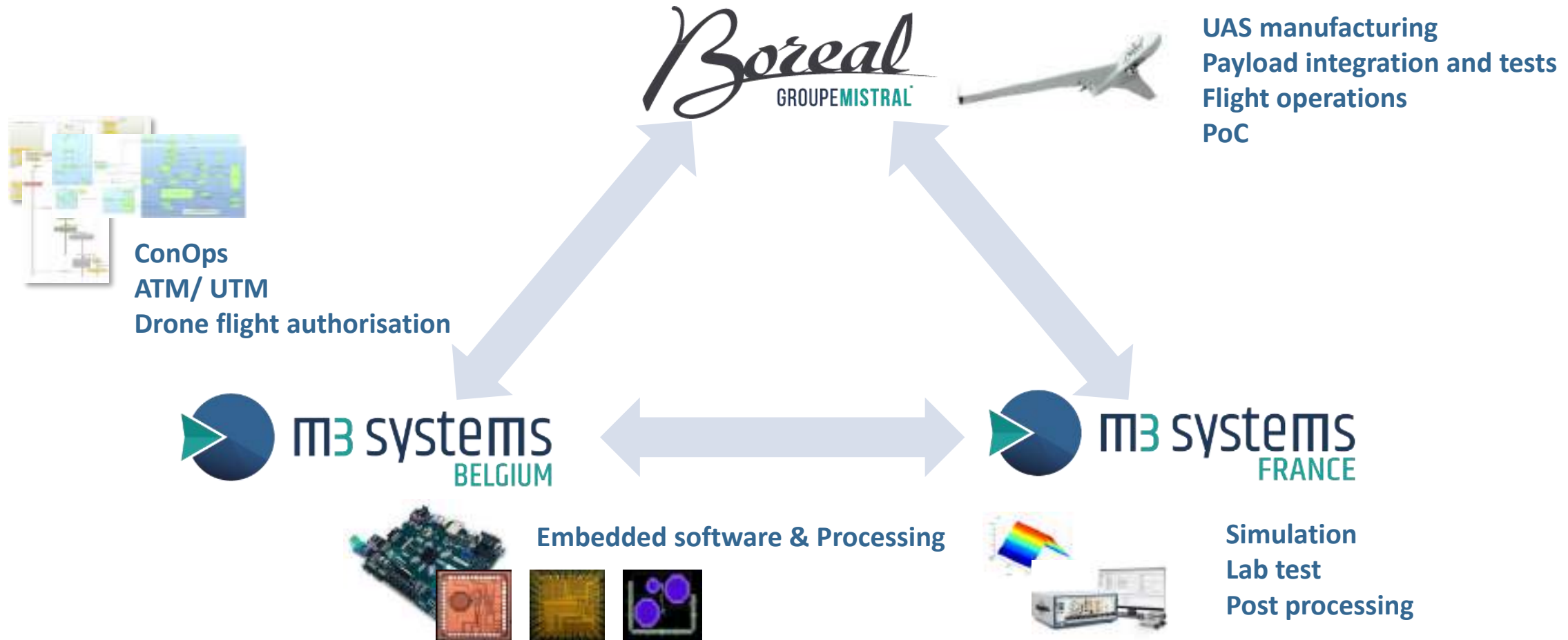
- GNSS (Global Navigation Satellite Systems)
- Air Traffic Management
- Radionavigation

- Long-range drone
- System integration
- Operations



# Value Chain & Synergies

Supporting our solutions and R&D on Earth observation



# Mistral Group

2022 figures



3,5M€

- France
- Belgium
- EU
- Canada
- USA
- China



38

- GNSS experts
- Software Developers
- ATM & UTM experts
- Drone experts



4 Offices

- **Toulouse:** multi-expertises center
- **Lavernose:** InnovLab and Showroom
- **Brussels:** ATM and UTM center
- **Wavres:** EU multi-expertises center

# Mistral Group

2022 figures



23

Years of  
Expertise &  
Innovation



> 20

Space  
European  
projects



> 10

Space patents



# Customers and partners





# Applications and R&D



# Earth observation

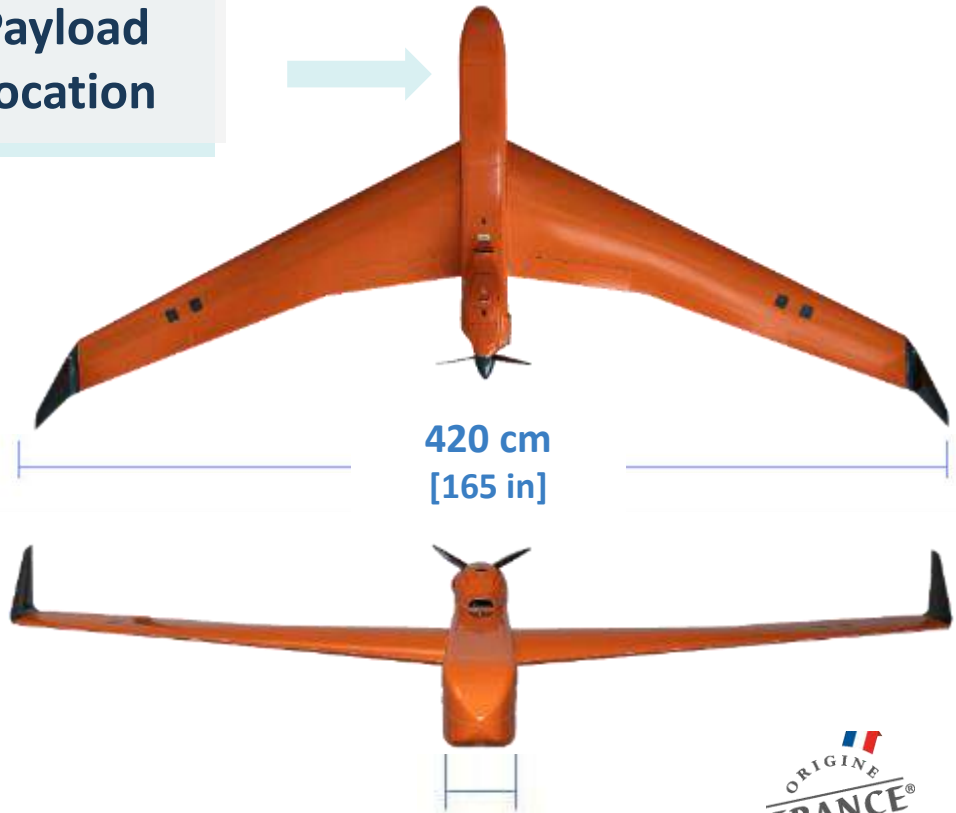
Portfolio of Solutions, applications and R&D

**GNSS Reflectometry by drone**  
**Forest and Sea Surveillance by drone**  
**Observation to support Search and Rescue (HASARDS)**

# The vector: BOREAL UAS

Payload  
Location

Top



Front



**7 Kg**  
Payload



**8 H**  
Endurance



**800 Km**  
Range



**25 Kg**  
MTOW\*

*\*Maximum Take-Off Weight*



# GNSS reflectometry



# GNSS Reflectometry

HORIZON 2020



## MISTRAL project -> 2018 Objectives

- Use a drone to provide soil moisture maps using GNSS reflectometry
- Data collection instrument on board a drone (antennas, RF front-end)
- GNSS data processing receiver and reflectometry measurements

## Current and Future activities

- Internal R&D
- Development of GNSS-R sensor algorithm
- Collaboration with CNES

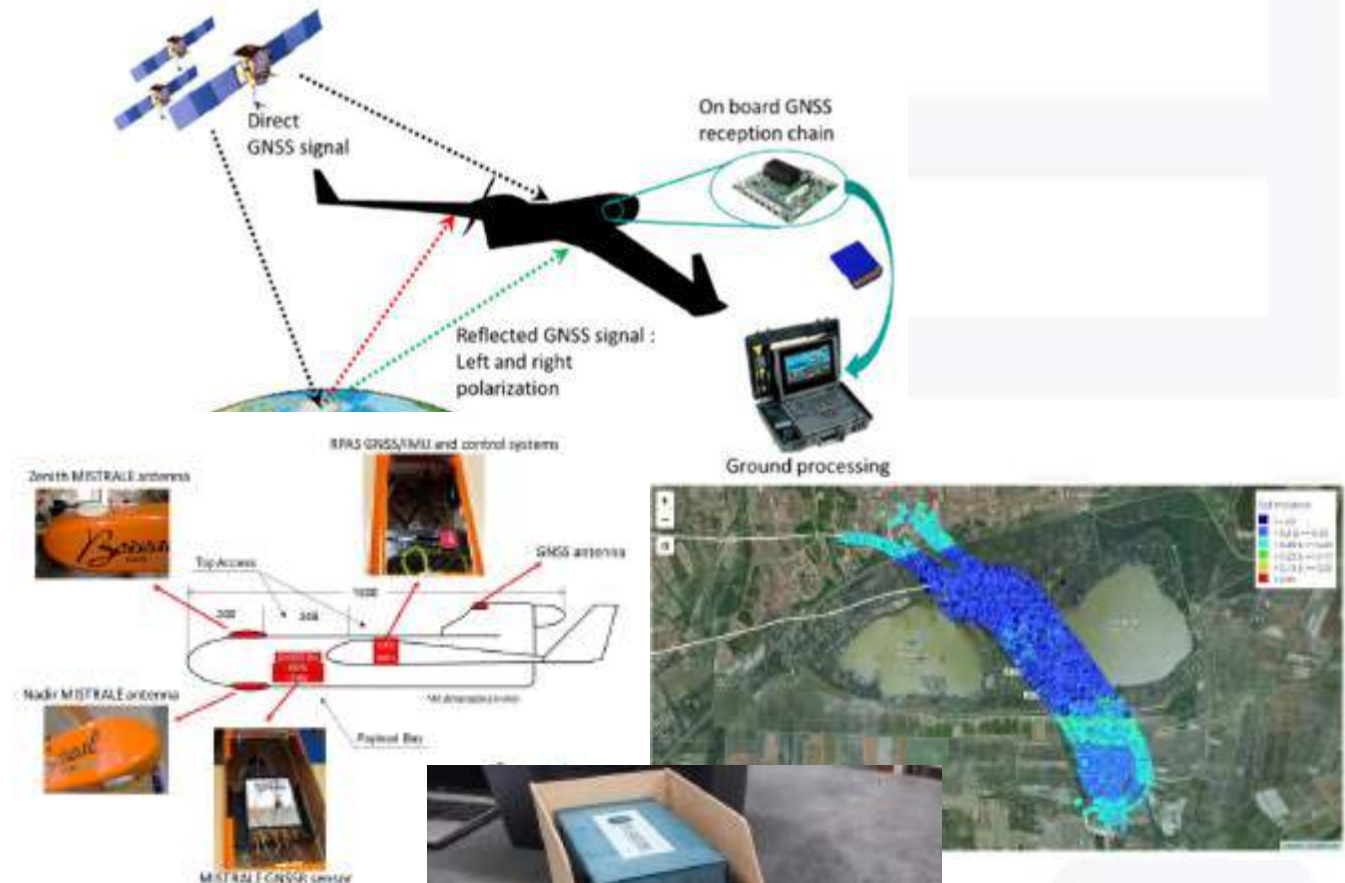


Figure 24 - MISTRAL GNSS-R sensor integration in long





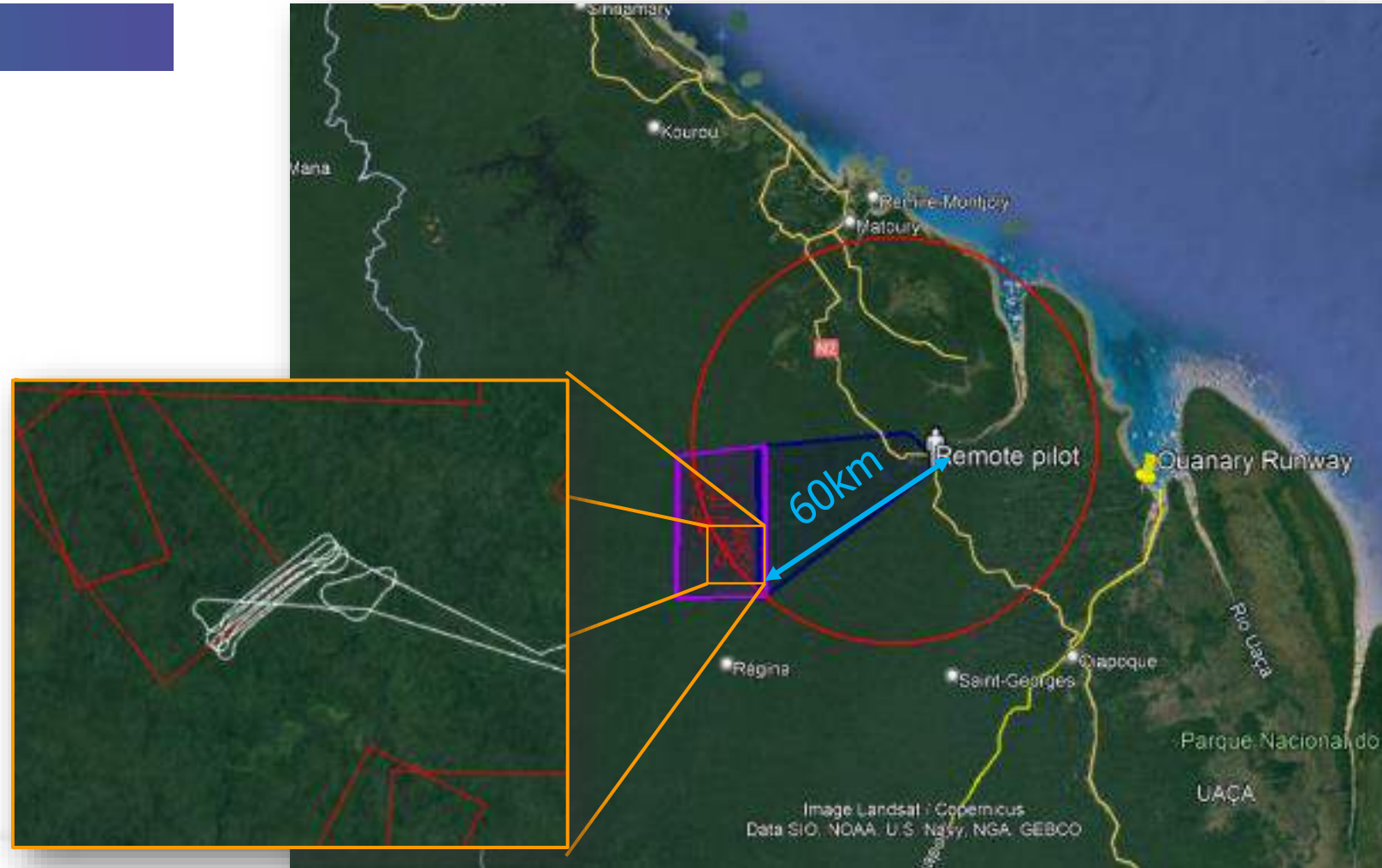
# **Intelligence Surveillance and Reconnaissance**



# Surveillance - BVLOS operations

## Guyana Campaign 2021

- ▶ Illegal gold panning monitoring
- ▶ Use of Satcom Link
- ▶ Specific payload integration





# ISR + 2022

## Operational Mission

- ▶ Validation of specific DRI (detection recognition identification)
- ▶ Acquisition of opportunity targets (boats, etc.)
- ▶ Sinnamary Estuary Bleaching
- ▶ Infrared test on mangroves



# Surveillance

## Payload integration

### Integrated Payload

- ▶ HyperSpectral
- ▶ Lidar
- ▶ Multispectral Camera (On-going)
- ▶ Cryogenic IR camera (future project)



#### MERIO TEMIS XL16

Weight : 1800g  
Pan: 360° / Tilt: 360°  
IP rating: IP64  
DRI (Detection/Recognition/Identification)  
Cargo ship, Cruise ship: up to 15000 / 4000 / 1500m  
Commercial fishing vessels: up to 6500/ 5500/ 1000m  
Sailing boat / traffic boat: up to 6000/ 5500/ 800m

*\* Between 1000 and 3300 ft (800 and 1000m) and in standard weather conditions.*



#### MERIO TEMIS XL

Weight : 950g  
Pan: 360° / Tilt: 360°  
IP rating: IP64  
HUMAM DRI : 1 029 / 309 / 218m  
CAR DRI: 2352/ 738 / 409m

### HYPERSPPECTRAL CAMERA



Spectral bands: 970 to 2500nm  
Spectral resolution: 300bands@5.1nm  
Image storage and transmission up to 55 km  
Ideal for detection in critical areas

### LiDAR RIEGEL VV



Ground accuracy:  
15 mm (0,6 in)  
200 scans / second  
360° field of vision

### VNIR Multispectral camera



6 cameras  
47-million-pixel global shutter CMOS sensor  
Removable spectral filters

*Integration on-going*



#### ASIO 155

Weight : 1500g  
Pan: 360° / Tilt: 360°  
Stabilization  
Day and night sensors  
Target detection  
Click and follow



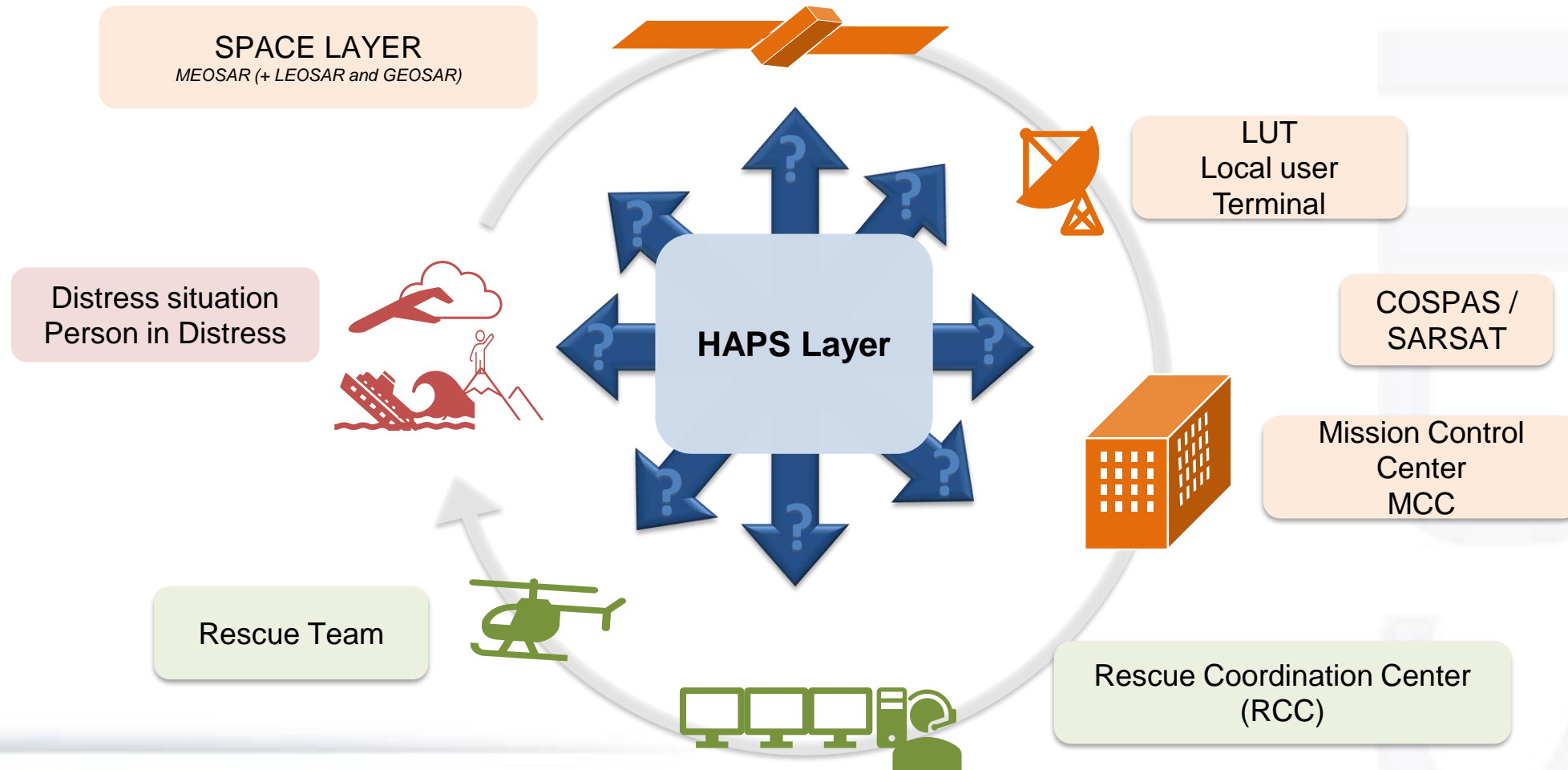
A satellite is shown in orbit above the Earth's surface. The satellite has a white cylindrical body with a large circular lens or sensor at the front. It is connected to a long, thin boom that extends upwards. Two large, dark solar panel arrays are attached to the sides of the satellite. The Earth's surface is visible below, showing a mix of land and water with clouds. The horizon of the Earth is visible on the left side of the image.

**Support to Search and Rescue**



# Support to Search and Rescue - HASARDS

## Haps-Augmented Search-And-Rescue Demonstration System



# Support to Search and Rescue – HASARDS

Detection - localization via multilateration and georeferencing.

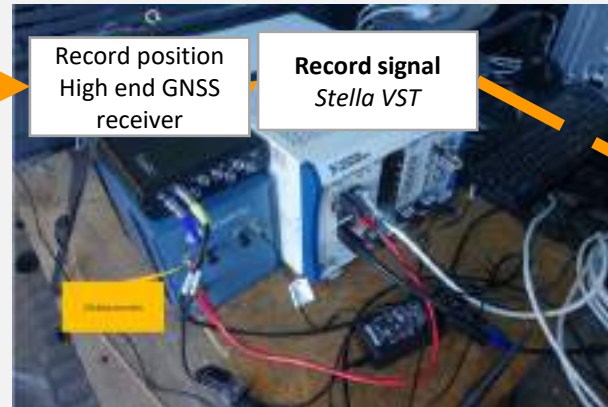
## Drone Flight



Cospas Sarsat  
beacon  
(ELT DT)

Representative of  
high-speed vehicle in  
distress

## Data recording (I/Q) on ground and in car.

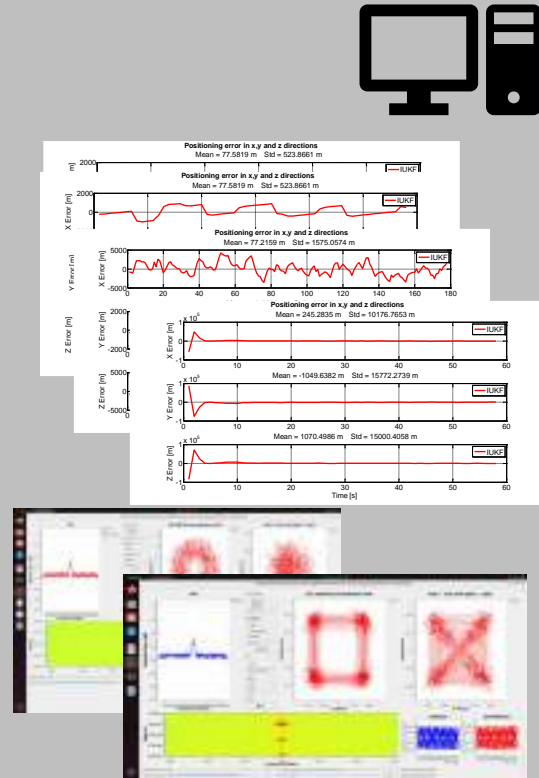


Recording on Ground  
car in movement

## Simulation



Simulation to assess  
Multilateration (4 HAPS)  
georeferencing  
@ different vehicle speed





# Questions?

Contact:  
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