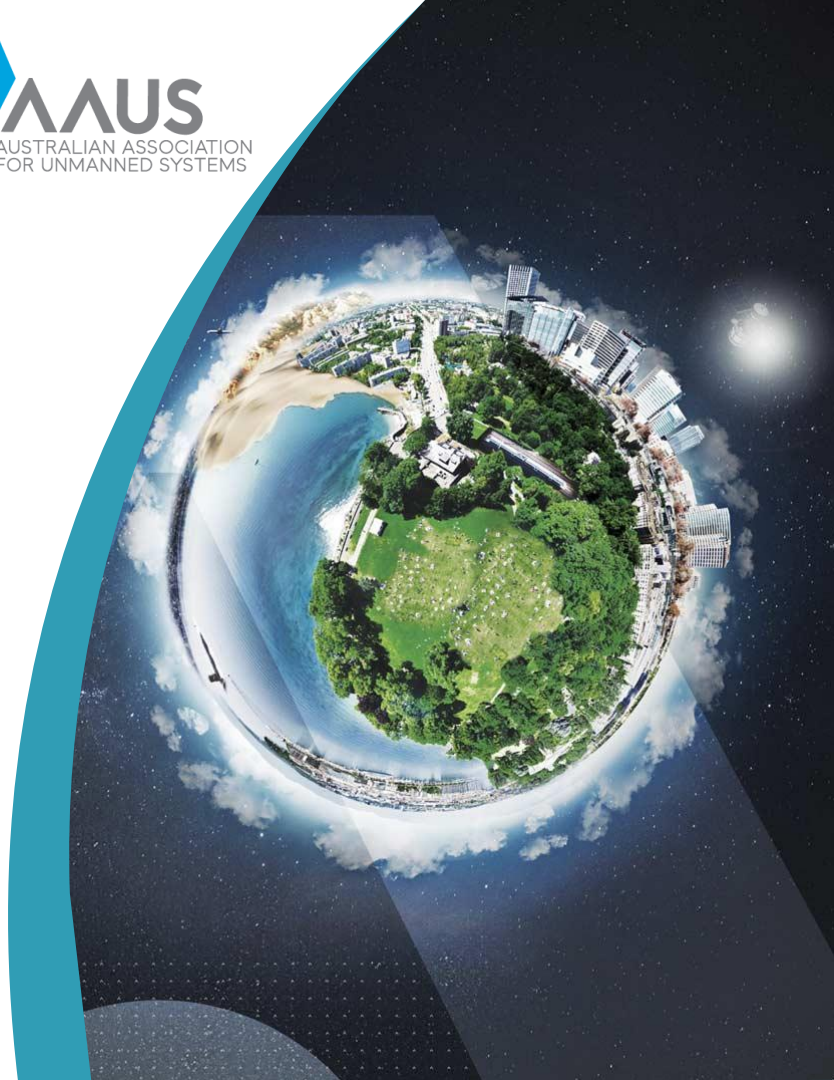
THALES

AAUS
AUSTRALIAN ASSOCIATION FOR UNMANNED SYSTEMS



RPAS in Australian Skies 2019

Geofencing, Identification and Tracking Solutions

The UAS long term vision: A world of drones

To address the drones issues we need to have a vison of the future

We believes that drones will be largely used .

Great numbers in the sky is a key element to consider.

Solutions we imagine for a safe and secure use of drones shall take into account this vison

Remote Id and geofencing

- UTM, relies on 3 basic pillars that will be the core and be the first step of a future efficient UTM
  - Registration
  - Identification
  - Geofencing

- These priorities seems to be largely agreed
  - USA
  - EU
  - Australia
  - China
  - …
- But not by all industrials
- Thales considers they are a top priority to enable a safe and secure operation and drones and a key element for the growth of the business

Remote Id

FAA definition

Remote ID is the ability of a UAS in flight to provide identification information that can be received by other parties.

- Remote ID would help facilitate more advanced operations for UAS and lay the groundwork for future Unmanned Aircraft System Traffic Management (UTM).
- Remote ID would assist the civil aviation agencies, law enforcement, and security agencies when a UAS appears to be flying in an unsafe manner or where the drone is not allowed to fly.

Remote Id is also the function necessary for “tracking” , de-confliction, and more globally, traffic management

Remote Id would be used by many users:

- UTM operators
- Security authorities

But also by

- Drone operators
- Public

Remote Id

Thales proposal:

- Regulators shall imposed asap Remote Id on all drones
  - 250g weight limit ?
- Different solutions according to the level of danger of the drones:
  - -3 levels ?
  - Very simple very low cost for small drones
  - More integrity, security and so on for larger , more dangerous drones
- Based on LTE network, assisted by other communication means when ever necessary
- Technical solutions exist, and could be very low cost
- World wide agreement on standards will be much preferable

Geofencing

Definition

More difficult to find a simple definition although No Fly Zone Geofencing has been successfully promoted for a long time by DJI

Thales consider several types of geofencing

- Security or legal geofencing
  - NFZ restriction, altitude restriction, distance to the operator … imposed by legal consideration based often on safety concern but not always
    - “security” requirements is the priority
    - Imposed to the operator but not the same rules for all

- Safety geofencing
  - Solutions to increase the safety level of a drone operation by restricting/ containing with confidence the flight area in order to obtain an authorization to operate
    - Safety requirements , according to Aviation standard, is the priority
    - Defined with or in collaboration with the operator

    (Also called containment in the SORA)

Geofencing

Thales proposal:

- **Regulators shall imposed asap legal geofencing on all drones**

- **Airworthiness authorities shall recommend Safety geofencing to improve small drone safety when necessary (SORA containment)**

  Legal NFZ geofencing: More difficult, reliable data base and good cyber protection remain the difficulties, but some solutions already exist
  Safety geofencing: Simple solution from aeronautics can be derived

- **Avoid "awareness only" NFZ geofencing**
- **NFZ unlocking under government management or by delegation**
- **Government shall provide good and reliable NFZ data base but " not too complex" one**

Example of work in progress

Example of Safety geofencing for light drones:

ADD ON solution

A trustful solution to be sure the drone will remain in its approved area of operation

High-end	**Medium-end**
Drone > 5 kg	Drone > 500 g
Level of Safety: Performance *: 10-7	**Level of Safety: Performance* : 10^{-4}**
SW : D0178 level B	SW : D0178 level B
HW : D0254 level B	HW : < D
Module SWAP	**Module SWAP**
20 x 80 x 80 mm	13 x 50 x 50 mm
< 300 g	< 80g
< 6 W	< 1 W

* Performance: guaranteed probability of going outside of the cage per Flight hour is less than :

Project requested by French DGAC : demonstration that a solution is possible on the smallest drones (ex DJI Mavic air)

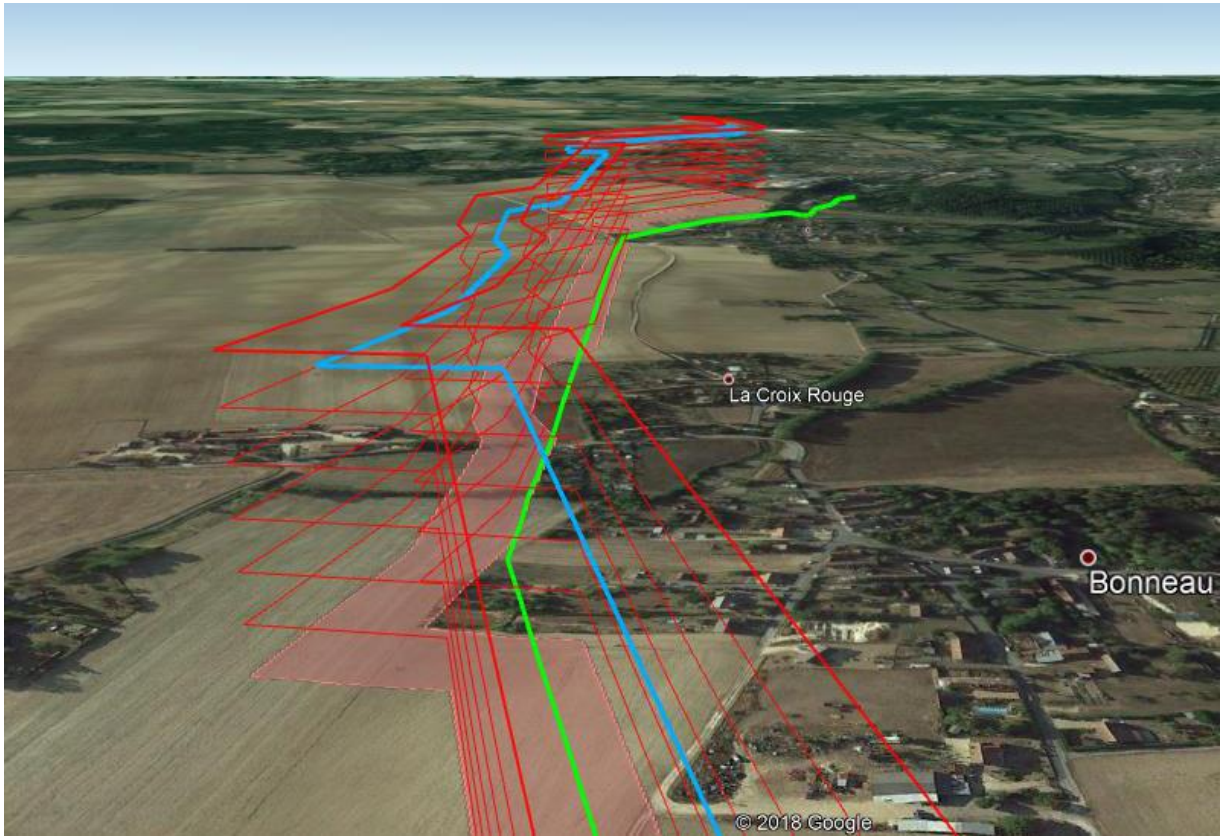
Geocaging/ Containment in accordance with the last EASA SORA requirement

Example of Safety Geofencing for BVLOS operation

Performance 10-7

Using aviation grade GPS

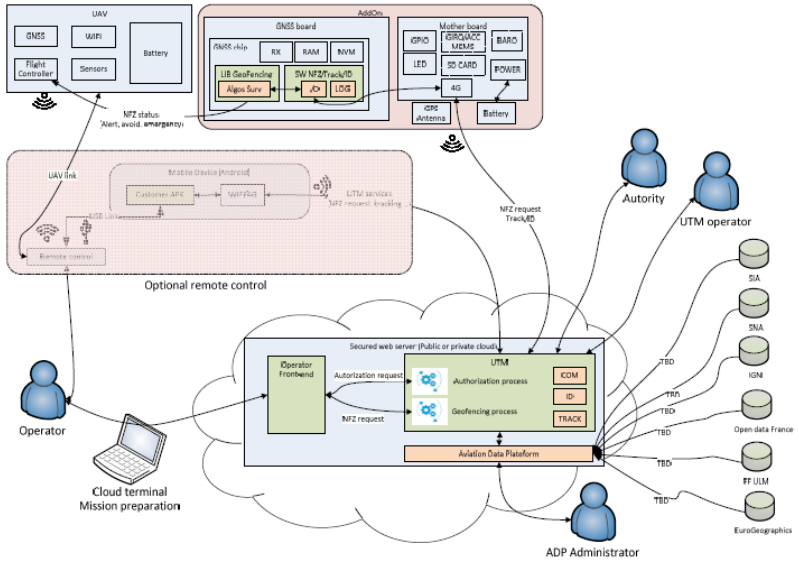
Tight Interface with FCS



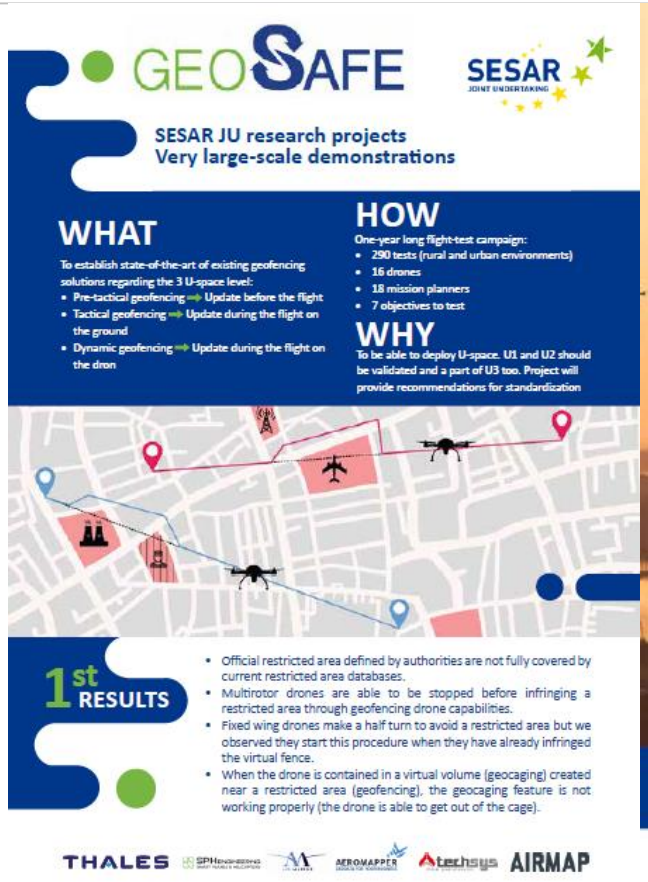
NFZ geofencing

Work in progress in France on 2 axes:

- **Develop a secure trustable NFZ data base fully in line with the regulations**
  - Including management of the authorizations for the operators authorized to work in NFZ
- **Develop a highly secured low cost on-board solution available for most flight controllers**
- **Tests in progress**



NFZ geofencing : SESAR JU study (under EU Uspace plan)



- Analysis of existing geofencing solutions to provide recommendations on future regulations and standards
- Including assessment of in flight dynamic geofencing

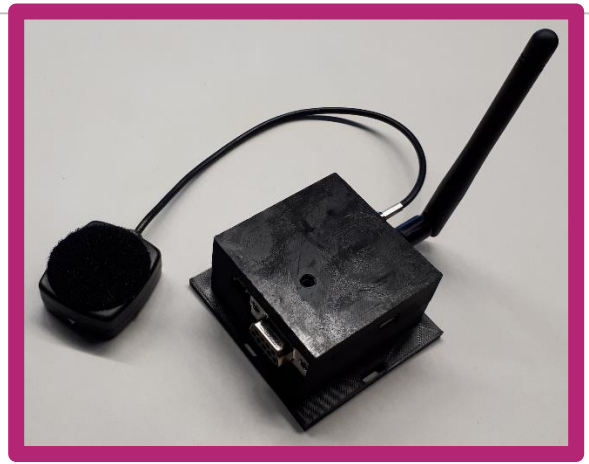
- No perfect solutions
- Some GPS performances issues
- NFZ data base main issue

- Large scale demo in September

LTE Secured communication multipurpose module

Testing in progress of a generic module from which solutions will be derived for

- remote Id,
- geofencing communication,
- C2 control ,
- mission data ….



Features

- **Drone Identification Data, Digitally Signed**
  - Drone ID/Mission ID; ata Sent time stamp/Position time stamp
  - Lat / Lon / Alt Data/ Speed…
- **End to End Secured Communication**
  - Multi data channel connexion
  - Flight Controler Interface (RS232, Serial, SPI, I2C, CAN)
  - TLS Encryption with Mutual Authentication

Connectivity

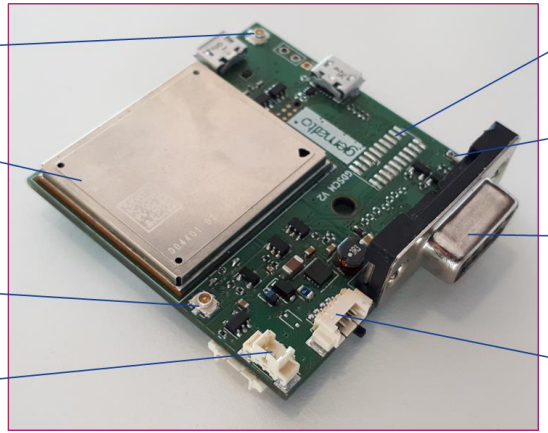
- 4G by default – 12 Band Worldwide

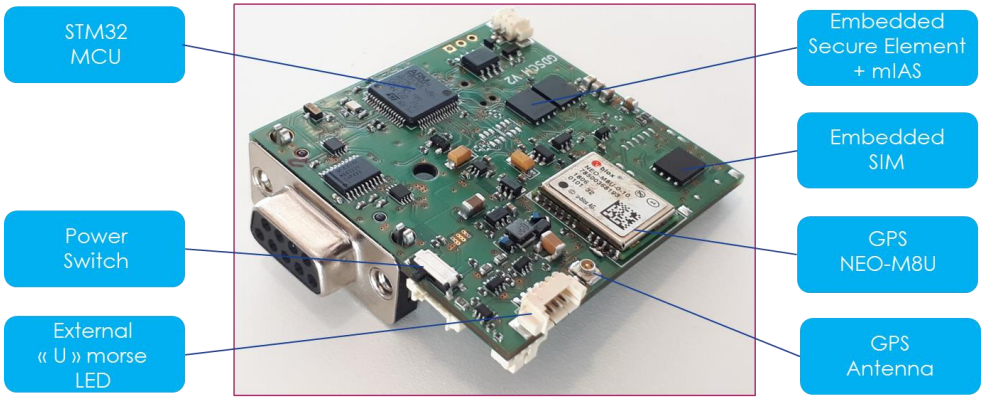
Scalability

- Extension card slot for additional functionalities
- such as: Second Cellular connectivity, Irridium, Wifi , bluetooth

- **Dimensions: 67 x 67 x 33 mm**
- **Weigth: 125 g**
  - LTE antenna: 5g
  - GPS Active antenna: 25g
  - Battery: 30g
  - GDSCM: 65g
- **Consumption : 130 mAh**

Secured communication module





Questions ?

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