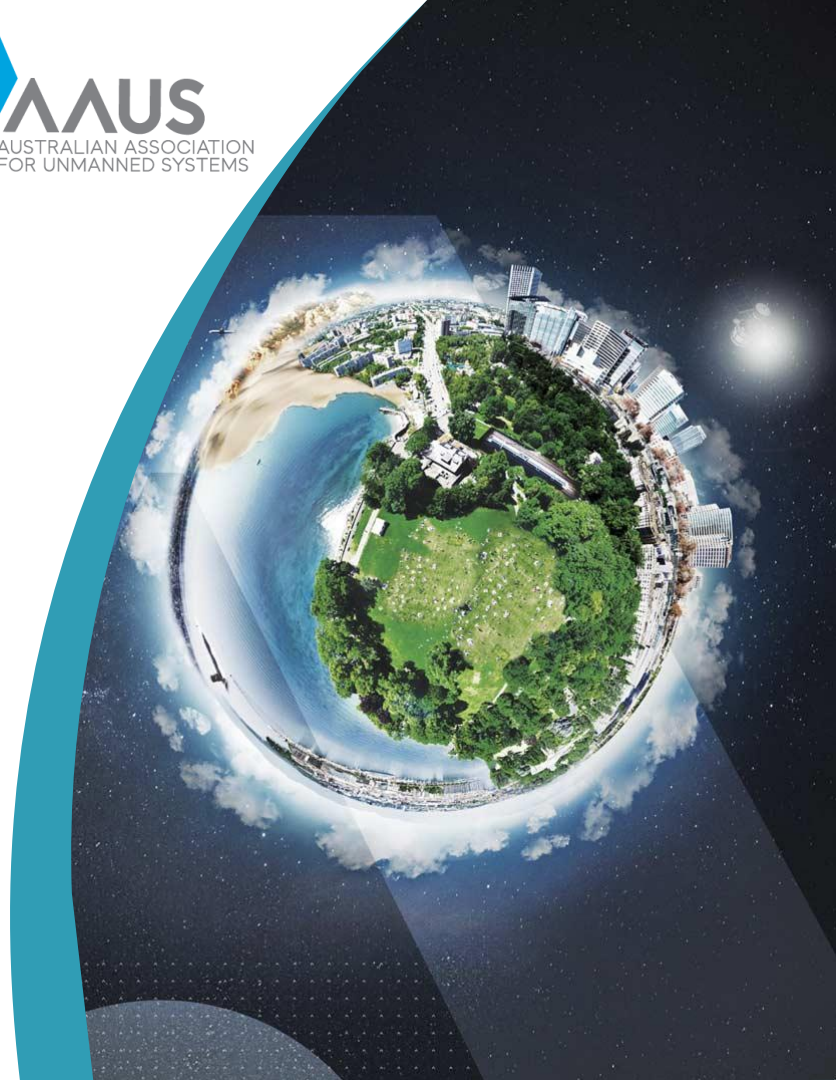


**THALES**



# **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 vision of the future

We believe 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 vision

# 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

## 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

## 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**

## 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)**

## 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**  
Drone > 5 kg

**Medium-end**  
Drone > 500 g

**Level of Safety:**  
**Performance\* : 10-7**  
SW : D0178 level B  
HW : D0254 level B

**Level of Safety:**  
**Performance\* : 10-4**  
SW : D0178 level B  
HW : < D

**Module SWAP**  
20 x 80 x 80 mm  
< 300 g  
< 6 W

**Module SWAP**  
13 x 50 x 50 mm  
< 80g  
< 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**

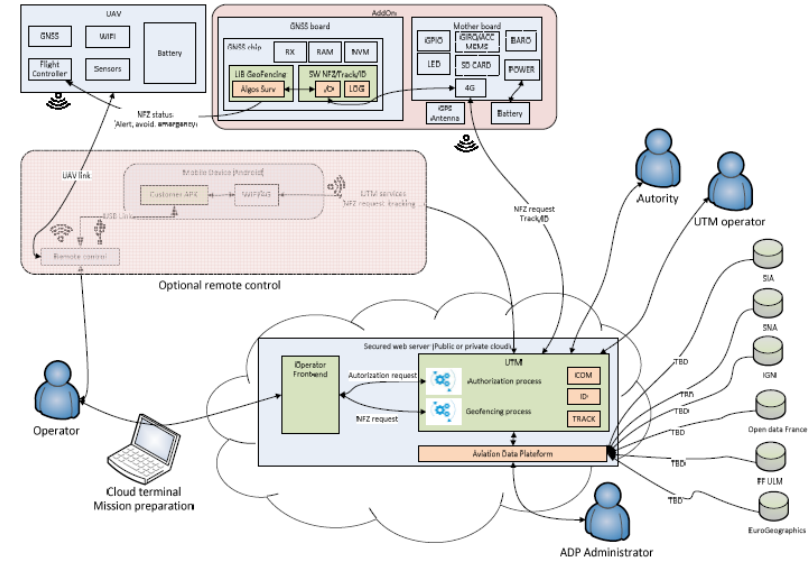
**Tight Interface with FCS**



# 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**



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



**SESAR JU research projects**  
Very large-scale demonstrations

## WHAT

To establish state-of-the-art of existing geofencing solutions regarding the 3 U-space levels:

- Pre-tactical geofencing → Update before the flight
- Tactical geofencing → Update during the flight on the ground
- Dynamic geofencing → Update during the flight on the drone

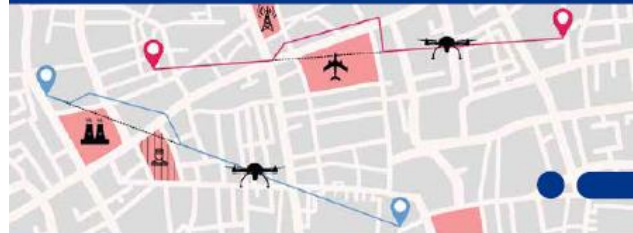
## HOW

One-year long flight-test campaign:

- 290 tests (rural and urban environments)
- 16 drones
- 18 mission planners
- 7 objectives to test

## WHY

To be able to deploy U-space. U1 and U2 should be validated and a part of U3 too. Project will provide recommendations for standardization



## 1st RESULTS

- Official restricted area defined by authorities are not fully covered by current restricted area databases.
- Multicopter drones are able to be stopped before infringing a restricted area through geofencing drone capabilities.
- Fixed wing drones make a half turn to avoid a restricted area but we observed they start this procedure when they have already infringed the virtual fence.
- When the drone is contained in a virtual volume (geocaging) created near a restricted area (geofencing), the geocaging feature is not working properly (the drone is able to get out of the cage).



## SAVE THE DATE

# 24<sup>th</sup> sept. 2019

Atechays, 6581 route de Rians, 83910 Pourrières FRANCE

Final demonstration will show several drones from different types flying near restricted area in a UTM context.

Scenario will be a search and rescue with the participation of firefighters.

This final demonstration will have several purposes; highlight the results obtained during the test period, show the technology readiness level of existing geofencing solution and show the link between active geofencing services and UTM services.

Contact: [Communication.AVS-FLX@fr.thalesgroup.com](mailto:Communication.AVS-FLX@fr.thalesgroup.com)

- 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 Controller Interface (RS232, Serial, SPI, I2C, CAN)  
TLS Encryption with Mutual Authentication

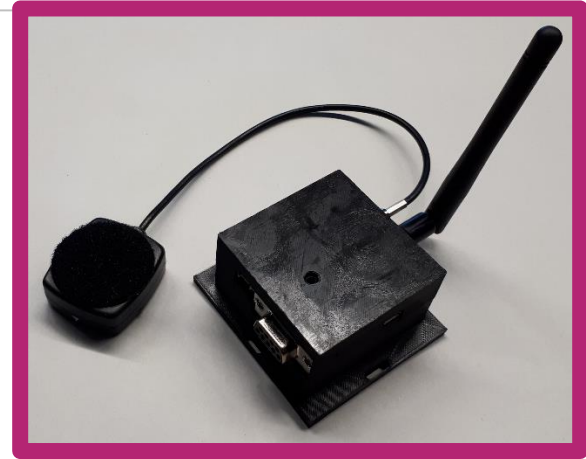
## Connectivity

4G by default – 12 Band Worldwide

## Scalability

Extension card slot for additional functionalities

such as: Second Cellular connectivity, Iridium, Wifi , bluetooth



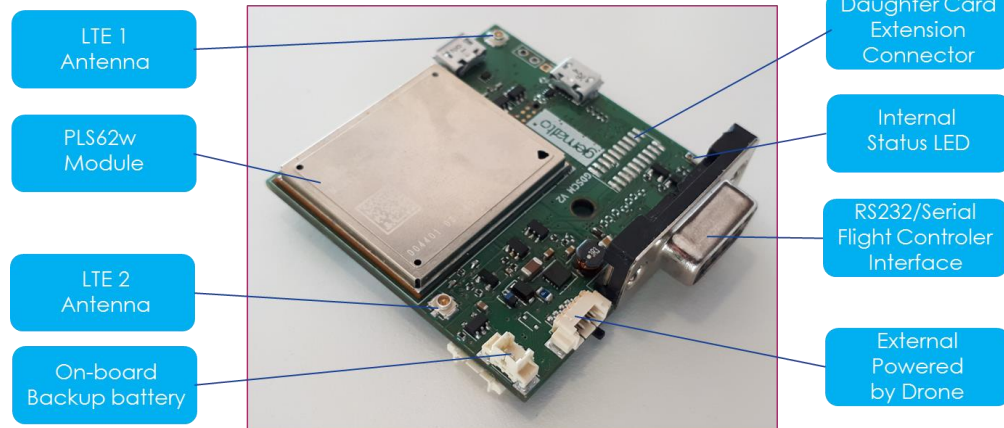
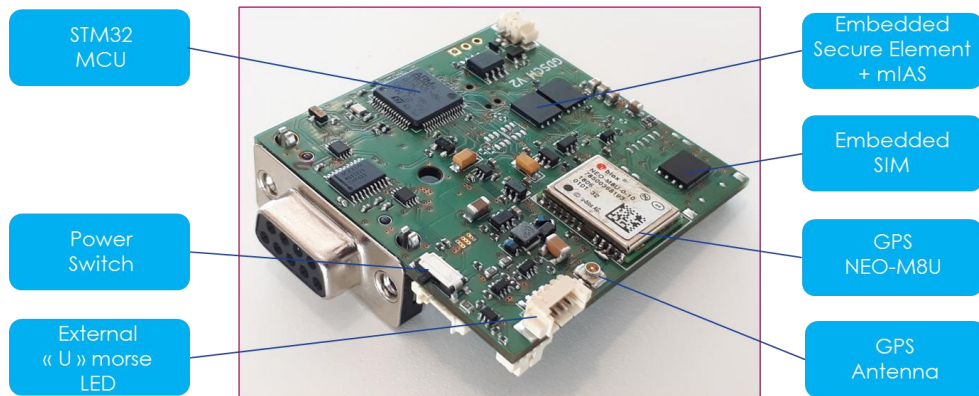
✦ **Dimensions:** 67 x 67 x 33 mm

✦ **Weight:** 125 g  
LTE antenna: 5g  
GPS Active antenna: 25g  
Battery: 30g  
GDSCM: 65g

✦ **Consumption :** 130 mAh

# Secured communication module

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# Questions ?

## Contact

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