CLASS Surveillance of UAS traffic



Mission: a stepping stone for surveillance of UAS

- Merge existing technologies to build core functions of U-Space
- Increase maturity level of these technologies
- Define Use Case Scenarios and Key Performance

Implementation

Merge and increase maturity level of:

- Airbus' Drone-It! cooperative surveillance system
- Indicators (KPIs) to assess the performance of future U-Space systems
- Provide baseline results through live and simulated trials

Scenarios and KPIs

Stakeholders' requirements gathered in a workshop yielded 6 design scenarios and 17 Key Performance Areas

Scenarios:

- GNSS failure leading to intrusion in an airport
- Instrument Landing System calibration
- Conflicts in an emergency situation
- Aerial work on high voltage linesUrban pollution sampling



- NTNU's Data fusion between
- Drone-It! and Aveillant's radar
- Unifly's Real-time UTMS
- Drones built and flown by ENAC with its Paparazzi open source autopilot.





KPIs:

Extract of KPIs relating to Accuracy, Detectability and False Classifications

KPI Name	KPI Definition	KPI Description
Horizontal Position Error (ePosH)	$RMS(pos_{H}^{T} - pos_{H}^{R})$	pos_{H}^{T} = Tracker Horizontal position
		pos_{H}^{R} = Reference Horizontal position
Vertical Position Error (ePosV)	$RMS(pos_V^T - pos_V^R)$	pos_V^T = Tracker Vertical position
		pos_V^R = Reference Vertical position
Probability of Update (PU)	$\frac{N_{DD}^{T}}{N_{DD}^{R}}$	N_{DD}^{T} = Drone Detections from Tracker
		N_D^R = Total Drone Detections from Reference
Mean Gap per track (mGAP)	$\frac{1 - PU}{N_{DT}^{T}}$	N_{DT}^{T} = Drone Tracks from tracker
False Positive Rate (FPR)	$\frac{N_{AT}^T - N_{DT}^T}{\Delta t}$	N_{AT}^{T} = All tracks from tracker Δt = time duration

Testing

- 2 real flight campaigns:
 June 2018: training the radar with 2 fixed wing drones.
 Paparazzi logs provides the reference data
- October 2018: Integration of Drone-It and Unifly systems to



the CLASS architecture

The Free Autopilot

Deconfliction

CLASS deconfliction takes place at a tactical level - i.e. during the flight - and before Detect and Avoid.

Airbus is working on a drone-drone tactical deconfliction algorithm, but the notion of "conflict" needs to be refined.



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ONTNU UNIFLY ARBUS AVEILLANT



Fabien BONNEVAL – fabien.bonneval@enac.fr , Jim SHARPLES, Yannick JESTIN, Mohammed Jahangir – mohammed.jahangir@aveillant.com