

Drones and manned aircraft in U-space

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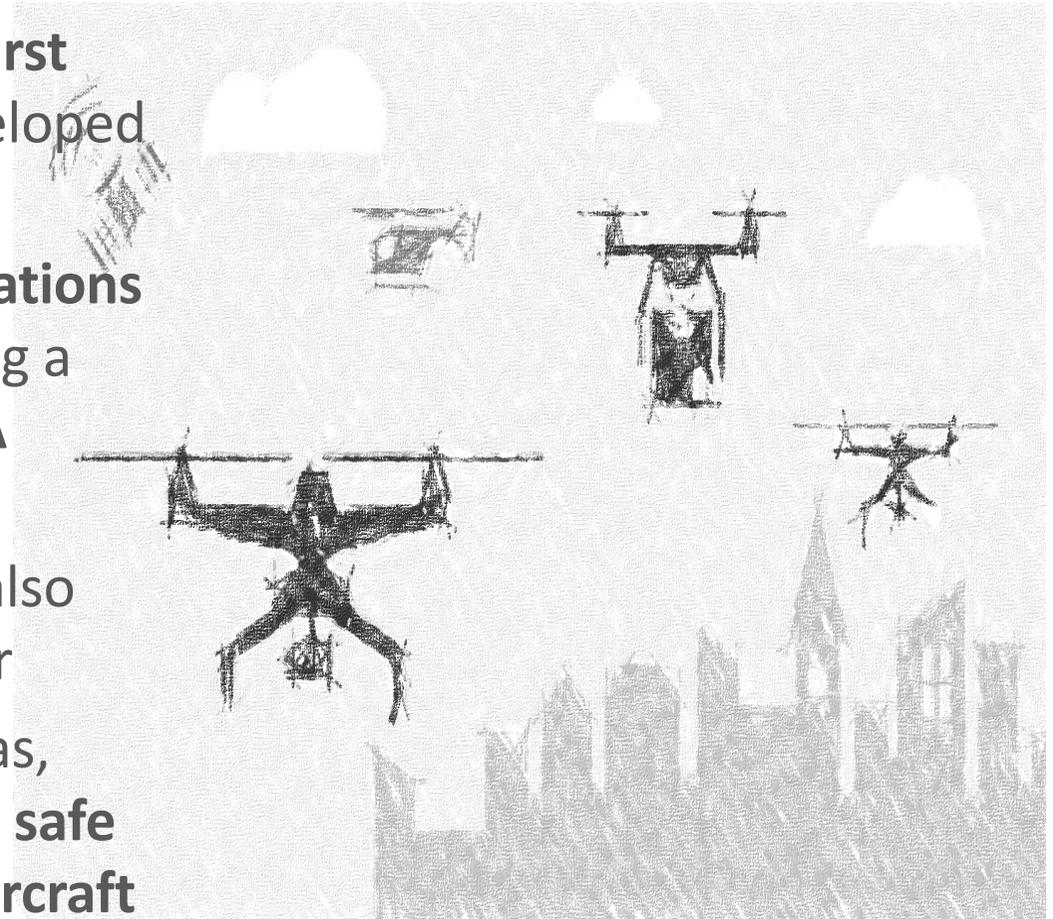
Terminology

- Drone (generic)
- RPAS: Remotely Piloted Aircraft System (ICAO)
- UAS: Unmanned Aircraft System (EASA, FAA)
- UAV: Unmanned Aircraft Vehicle (often used for heavy UAS)



Recent developments

- On 31/12/2020, **Europe** became the **first region in the world** where a fully developed **regulation on drones** is applicable
- More than **2000 operational authorisations** have been issued by the EU NAAs using a brand new risk-based approach: **SORA** (Specific Operations Risk Assessment)
- On **traffic management**, **Europe** was also the **first** to adopt a regulation last year
- Starting from the most congested areas, **U-Spaces** will be deployed to ensure a **safe integration of drones with manned aircraft**



What is U-Space?

WHY ?

- to enable airspace sharing between manned/unmanned aircraft
- to ensure safe separation of manned aircraft and drones
- to ensure drones can fly safely in the airspace
- to enable complex and long distance UAS operations (BVLOS)
- to enable Urban Air Mobility

Volume of airspace



Set of services

U-space Service Providers (USSP) services

 UAS flight authorisation	 Geo awareness	 Network e-identification
 Traffic info	 Weather info	 Conformance monitoring

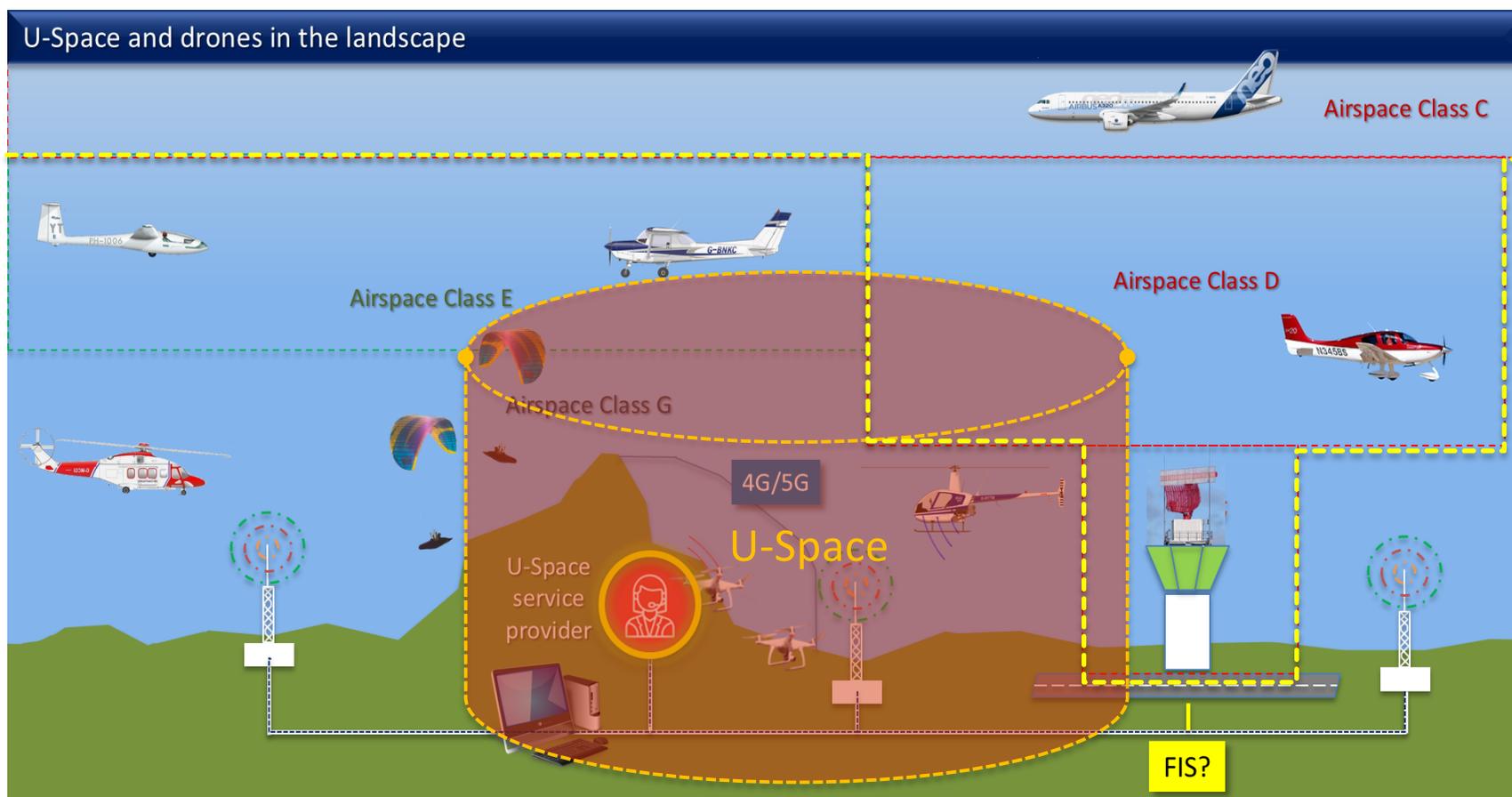
Information exchange

DIGITAL- distribution of information and data based on connectivity and internet services

Geographical zone designated by the Member State on the basis of a risk assessment and considering safety, security, environment and privacy



What is U-Space?



U-Space: 4G/5G used to operate the drones. Potential conflicting traffic information (FLARM, Skytraxx, Mode C/S, ADS-B...) can be communicated to the U-Space service provider via ground network.

What is U-space (by DRONIQ) ?

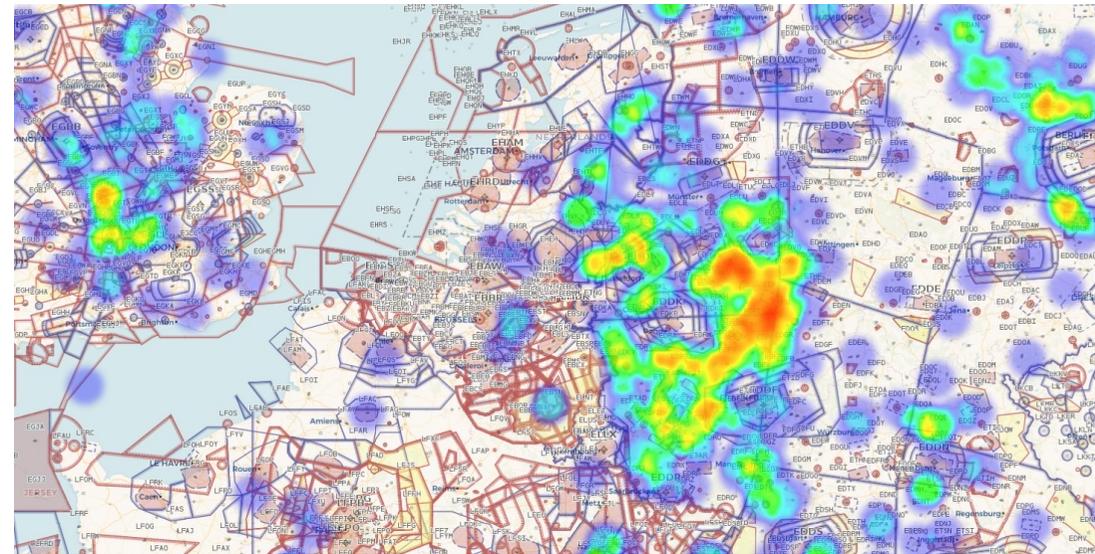


Surface: 30 km²
Height: 150 m
BVLOS flight: 24 km



U-space

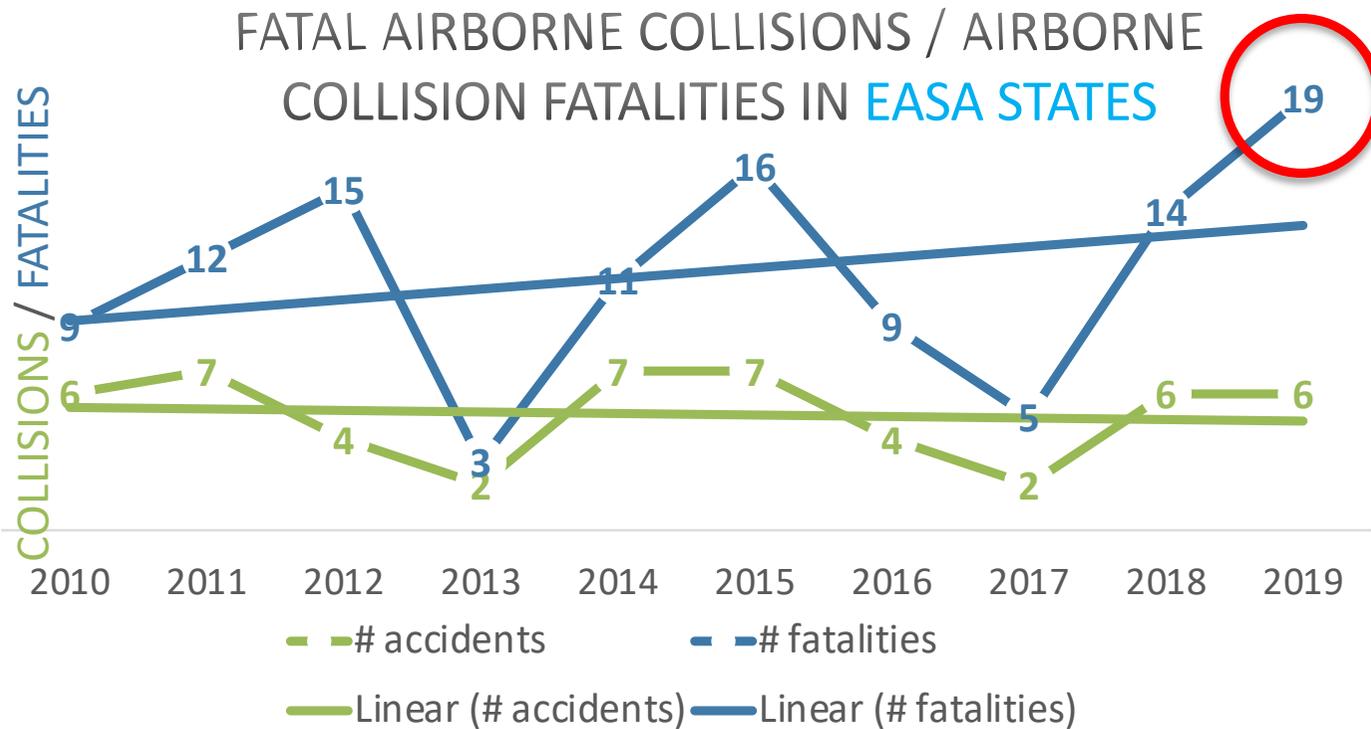
A set of *'new services'* and *'specific procedures'* designed to support safe, efficient and secure access to airspace for large numbers of drones *without airspace segregation*



iConspicuity

'in-flight capability' to transmit position and/or to receive, process and display information about other aircraft, airspace, obstacles or weather in a real time with the objective *to enhance pilots' situational awareness*

Manned aircraft - Safety data 2009 - 2019



60 FATAL COLLISIONS
~
6 PER YEAR

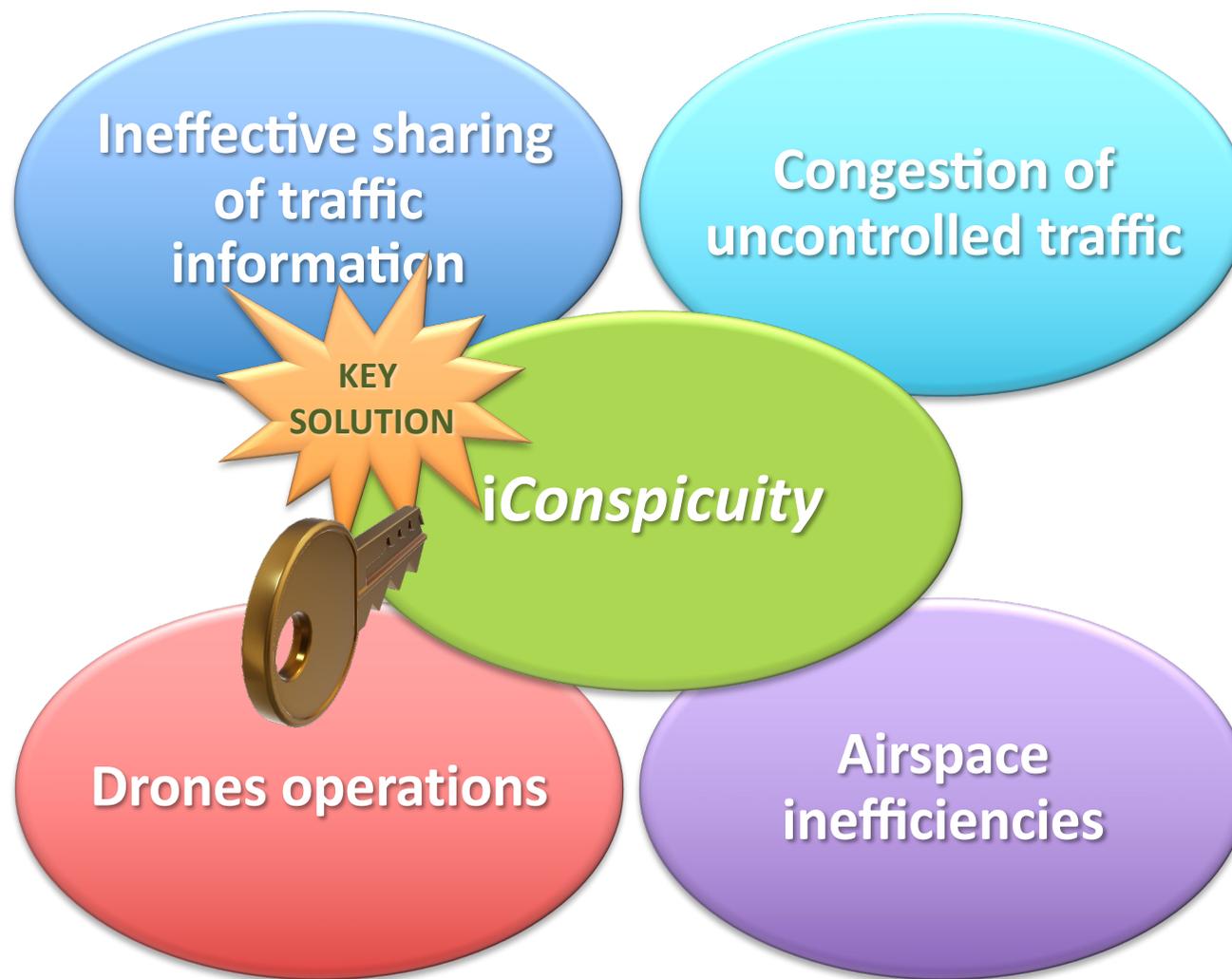
137 FATALITIES
~
13 PER YEAR

ALL UNCONTROLLED TRAFFIC

ALL SMALL AIRCRAFT*

*MANY ROTORCRAFT

Be conspicuous



High Level Roadmap

Step 1

Propose a solution for U-space airspace

AMC/GM SERA.6005(c):

*Manned aircraft operating in airspace designated by the competent authority as a **U-space airspace**, and not provided with an air traffic control service by the ANSP, shall continuously make themselves **electronically conspicuous to the U-space service providers***

[SERA: Standardised European Rules of the Air]

*i*Conspicuity for Rotorcraft and General Aviation

Step 2

Build on the U-space solution

Expand the functionalities and **address the GA and Rotorcraft conspicuity issue generally, including** the possibility to use the information broadcasted for **Flight Information Service**

Constraints & Boundaries

Development of AMC/GM to SERA.6005(c)

Aircraft (manned)

- **Affordability** (to end users)
- Technology **available now** (aviation & other)
- **Single device policy**
- Simple installations
- Enable airborne collision risk mitigation for manned aircraft

USSP

- Minimum necessary position information (incl. from 3rd parties)
- **Affordable infrastructure** (ideally compatible with UAS needs)
- Minimum performance meeting U-space objectives

Resources

- Existing international standards (aviation & other)
- **Pan-European applicability**
- ITU regulated spectrum
- **Machine readable**
- Open standards (non-proprietary or free of royalties)

Means of Transmission

ADS-B Out (1090 MHz)



For certified aircraft, using the **existing certified technology** already installed on board

ADS-L (SRD-860)



Non-certified devices transmitting at low power on the licence-free band SRD-860, in compliance with ADS-L specifications

ADS-L (Mobile telephony)



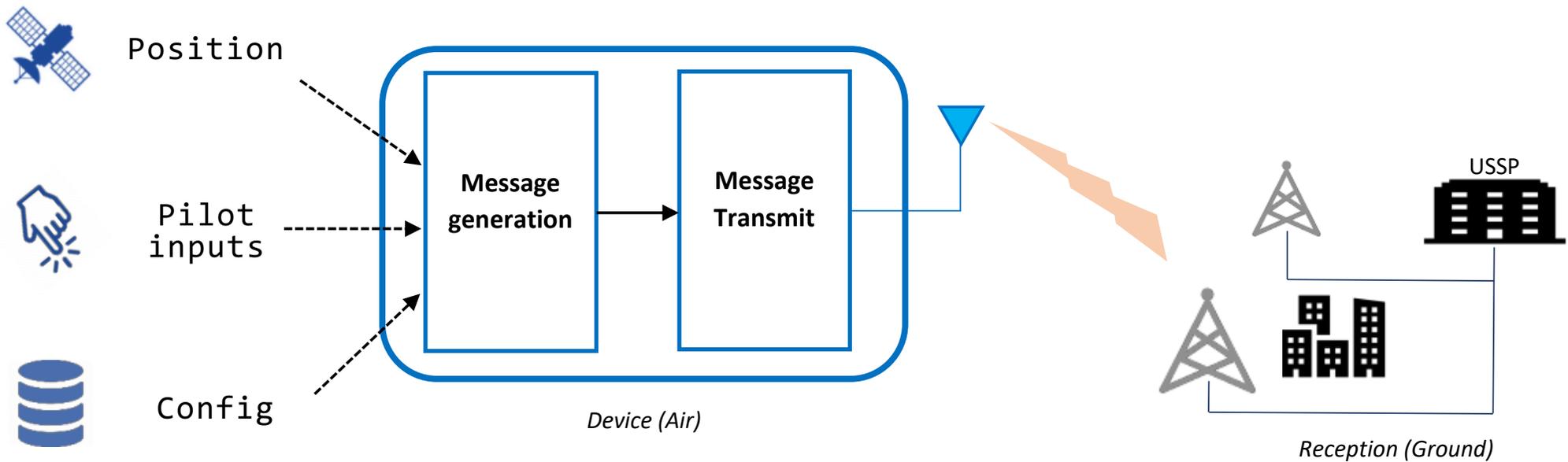
Mobile telephony application transmitting in compliance with ADS-L specifications



Introducing ADS-L

- **Minimum standard** for making manned aircraft in U-space conspicuous to USSPs
- **Principle: “-L” is for “Light”**
 - Derived from **ADS-B** and **simplified**
 - **GNSS-based** parameters
 - Compatible with **low-cost devices** and **mobile telephones**
- Should support possible **future applications** (traffic awareness)

ADS-L Concept



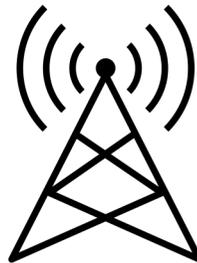
Mobile Telephony Feasibility Study

Yes, BUT...

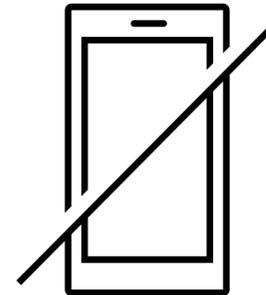
Can existing mobile telephony technology make aircraft electronically conspicuous to USSPs today?



**Legal certainty
for aerial use**



Standardization
(frequencies, services, roaming ...)



**Smartphones /
Dedicated devices**

Summary – Step 1

Certified ADS-B out

- ✓ ICAO standard
- ✓ Already installed
- ✓ All elements in place



SRD 860 Band

- ✓ Utilises past investments
- ✓ Affordable infrastructure
- SOON EASA specification



Mobile Telephony

- ✓ Existing infrastructure
- ✓ Affordable to new users
- SOON Coordinated decision*



Vulnerability of manned aircraft to drone strike

EASA research project

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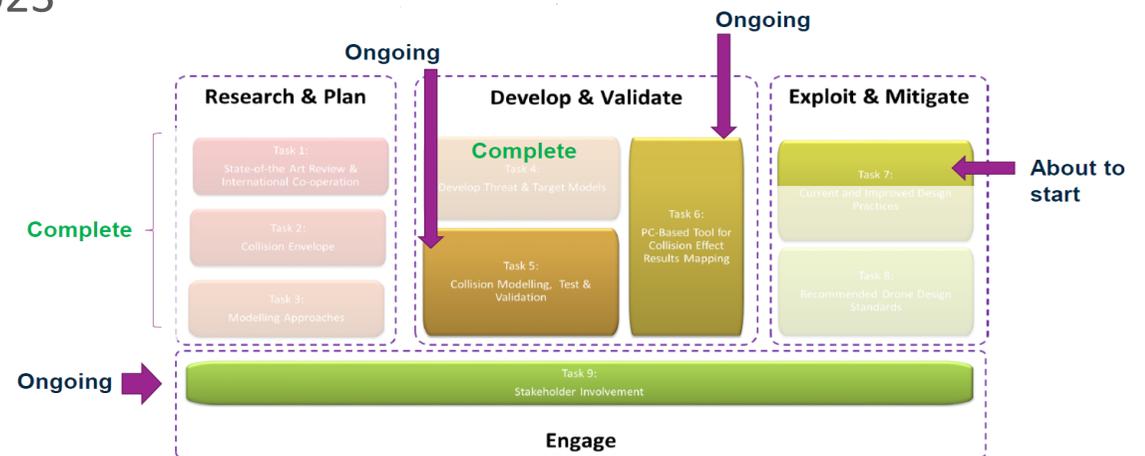
prepared by Antonio Marchetto

UAS Policy Project Manager



The Project

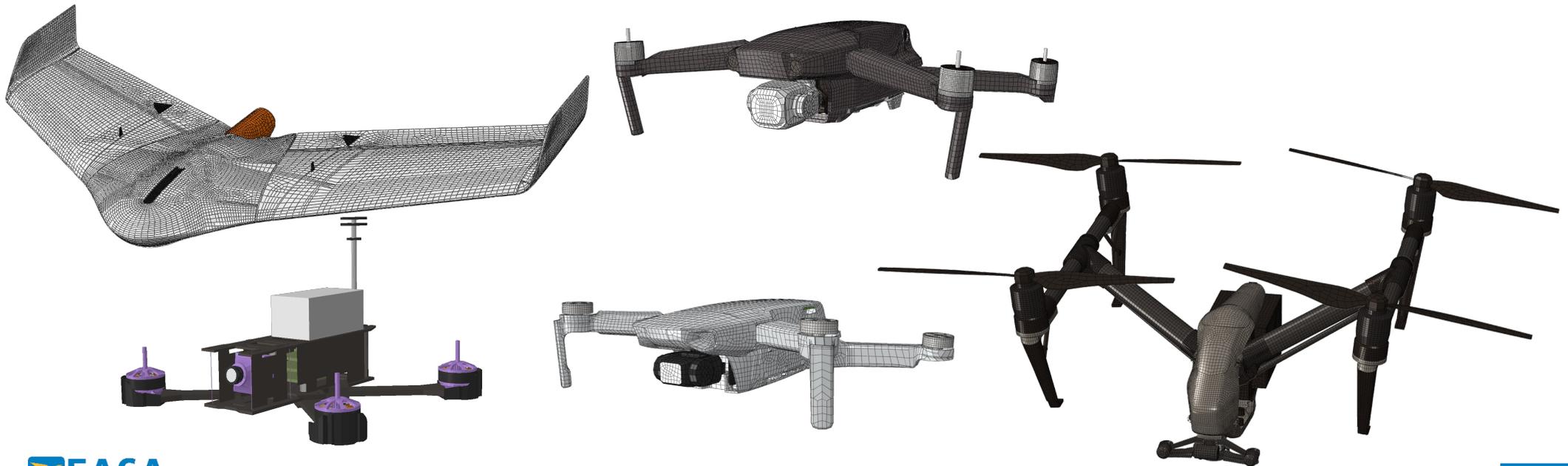
- Horizon 2020 project, awarded to QinetiQ [Vulnerability of Manned Aircraft to Drone Strikes | EASA \(europa.eu\)](#)
- Predecessor: EASA TF *drone collision with aircraft* [‘Drone Collision’ Task Force | EASA \(europa.eu\)](#)
- 3 years duration, June 2020 – June 2023
- Organized in 9 tasks
- Progress: on time
- 2 deliverables are published on the EASA website
- Large stakeholders group
- Key Objectives:



- **deepen understanding of the effects of collisions between mass market drones and manned aircraft** (experimental testing and simulations)
- **identify drone design strategies** aimed at containing the risk that drone-aircraft collision may induce on the aircraft and its occupants
- **define draft design requirements and test standards for future, more frangible drones**, to be put on the EU market

The Drones (“threats”)

- 5 drone configurations selected, to represent common classes of consumer / prosumer products
- Each has been modelled in detail and validated against test data, at a component level



The fixed wing “target” aircraft



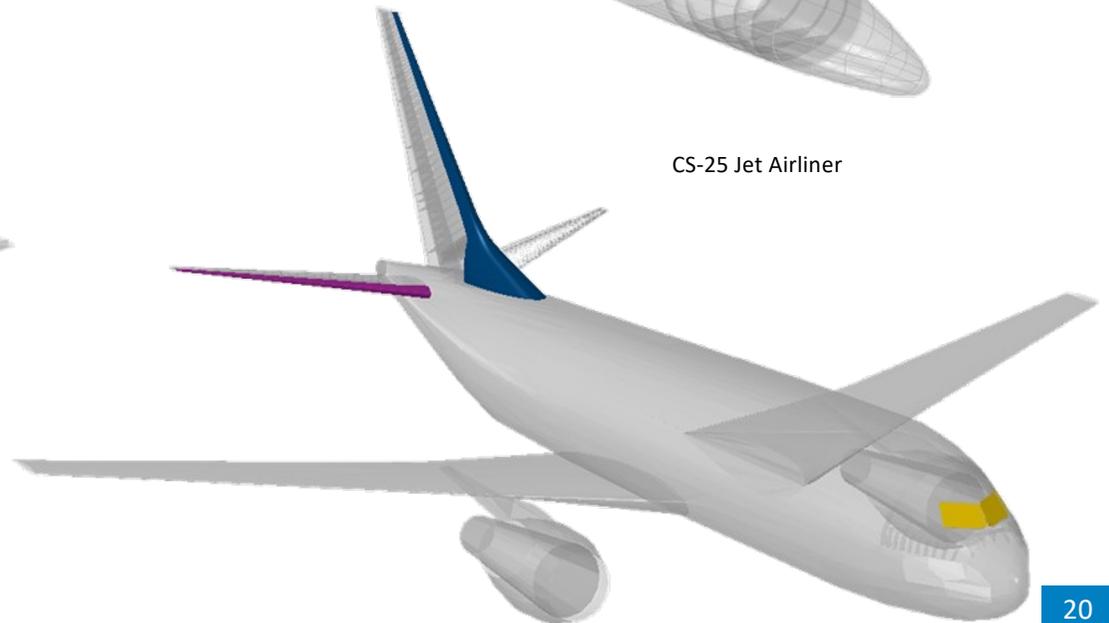
CS-23 Single Propeller GA



CS-23 Light Business Jet

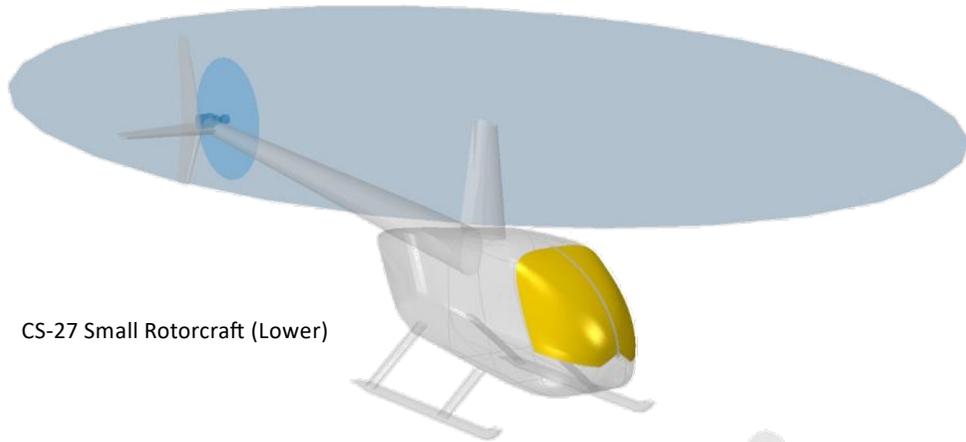


CS-23 Twin Propeller GA

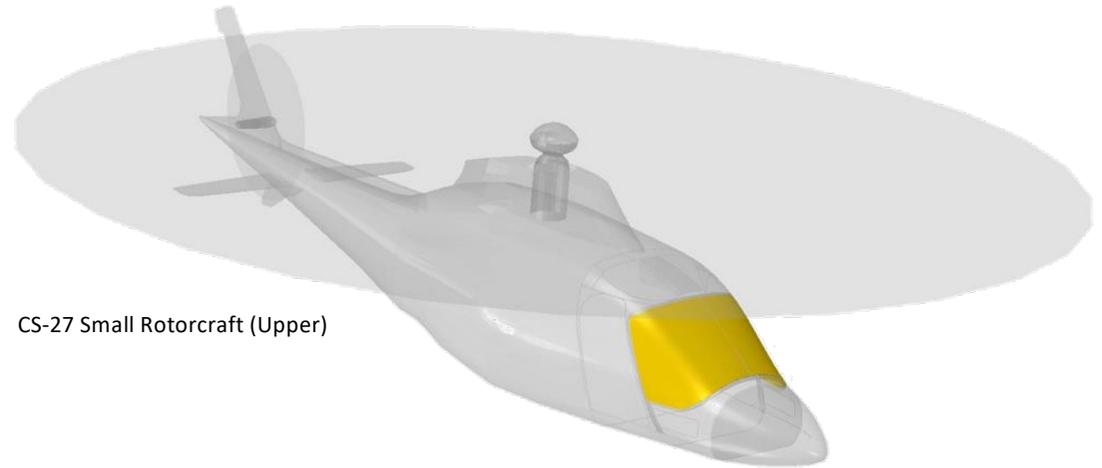


CS-25 Jet Airliner

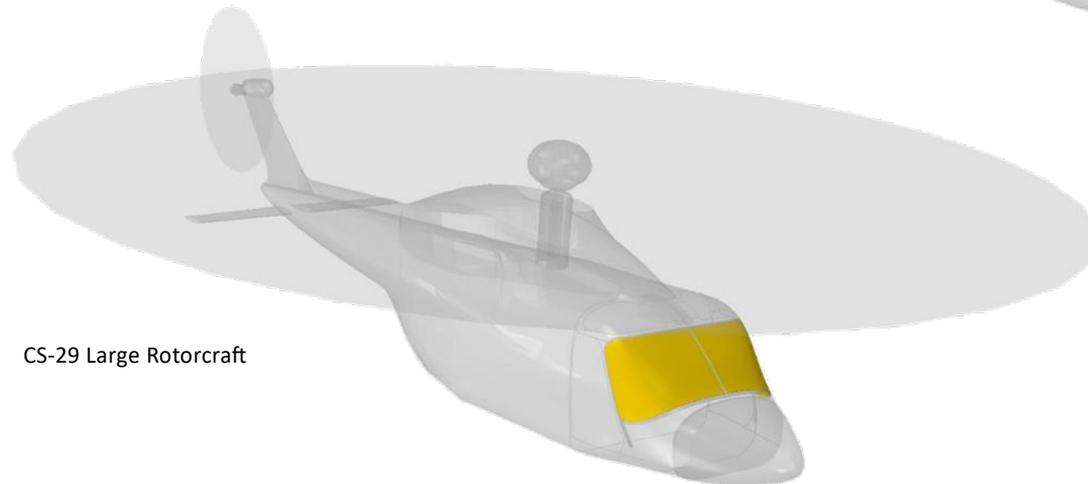
The rotary wing “target” aircraft



CS-27 Small Rotorcraft (Lower)

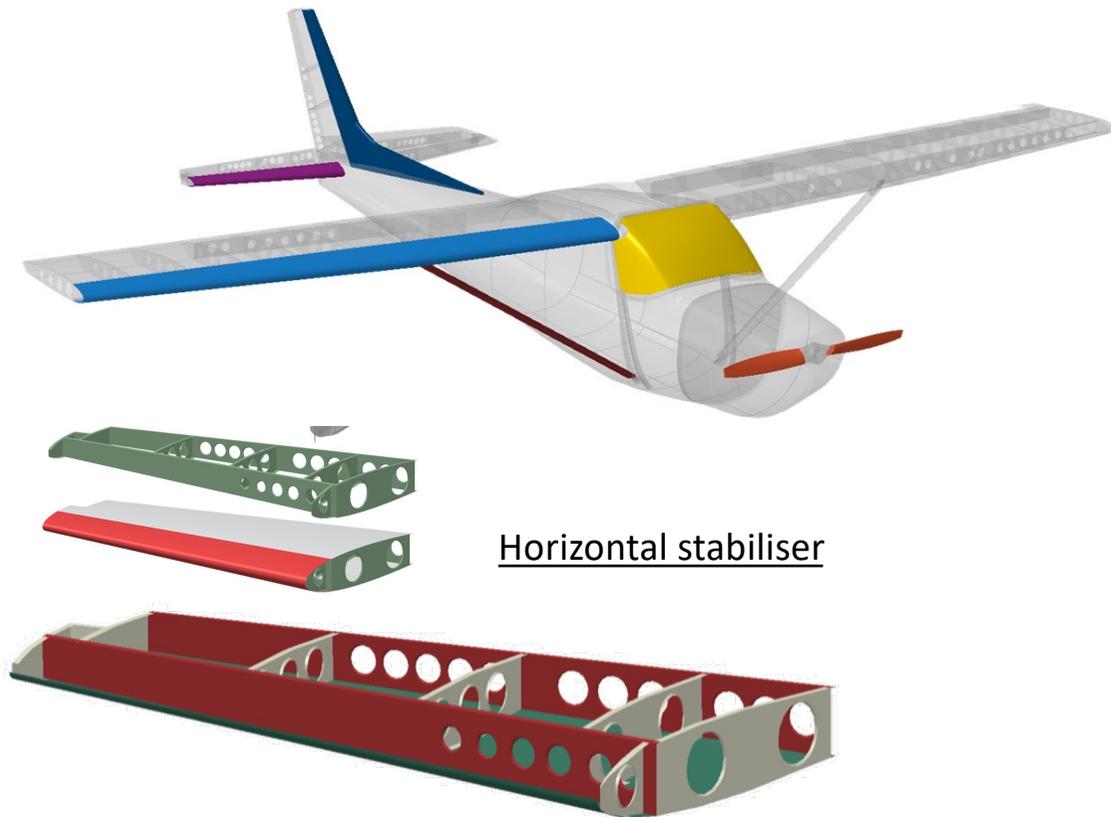


CS-27 Small Rotorcraft (Upper)



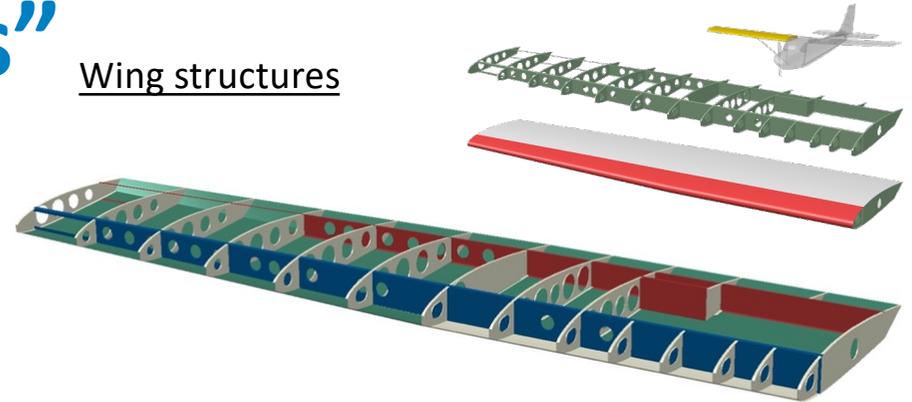
CS-29 Large Rotorcraft

Example of “local targets”

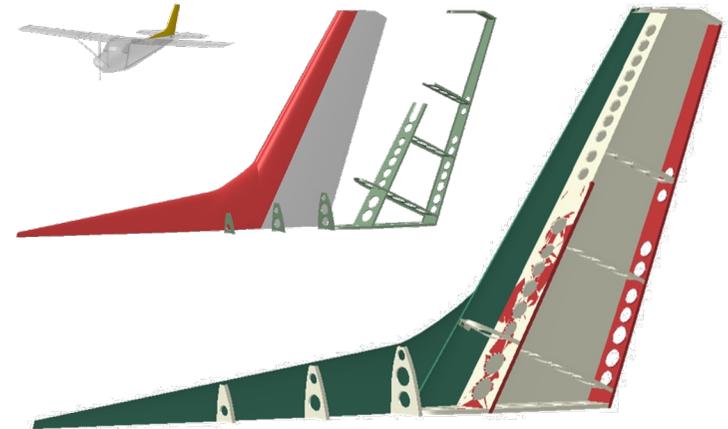


Horizontal stabiliser

Wing structures

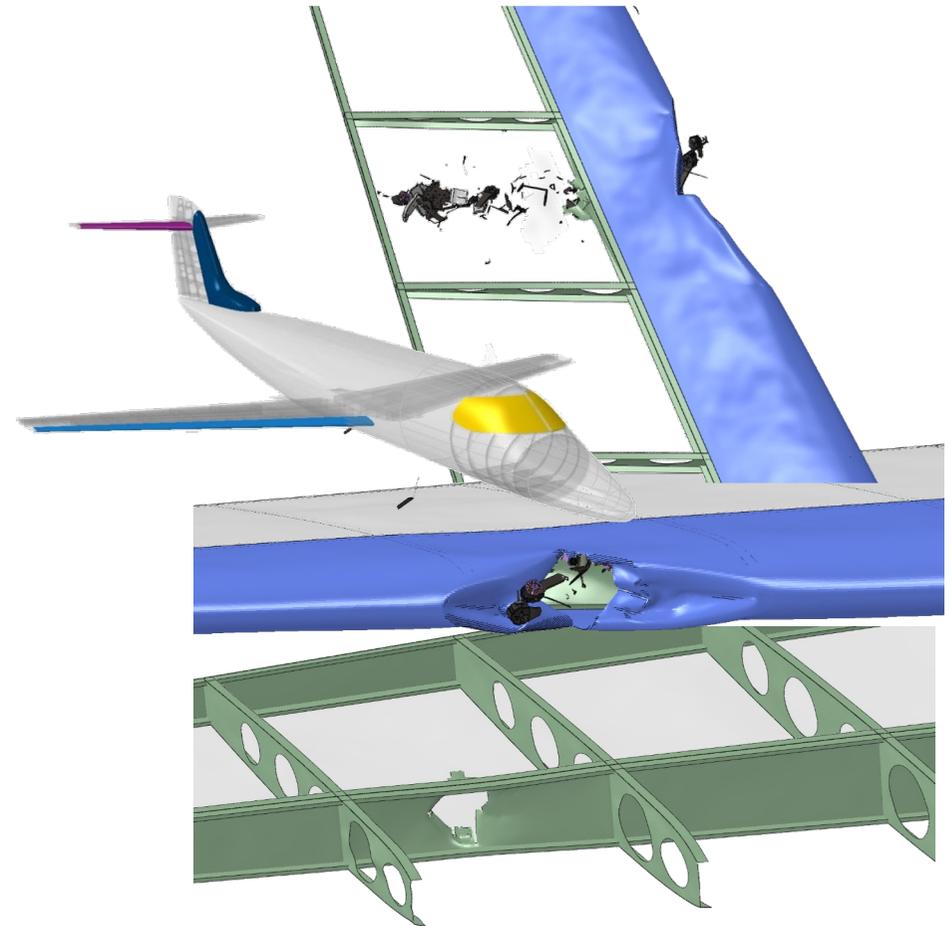


Vertical Fin



Status

- To-date approximately 1,500 simulations have been run against a combination of windshield, tail rotor, leading edge, propeller, wing strut and pitch control linkage targets.
- Results are being compiled into a summary report and database, which will allow to view simulation imagery (including videos) of pre-calculated impact scenarios.
- The data will be used to evaluate the threat posed by commercially-available drones
- Ongoing work will explore **how the introduction of a drone design/test standard could help to manage the threat posed by this emerging class of air vehicle**



Thank you

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