

# Safe and secure integration of drones (U-space)

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DRONE ENABLE/3

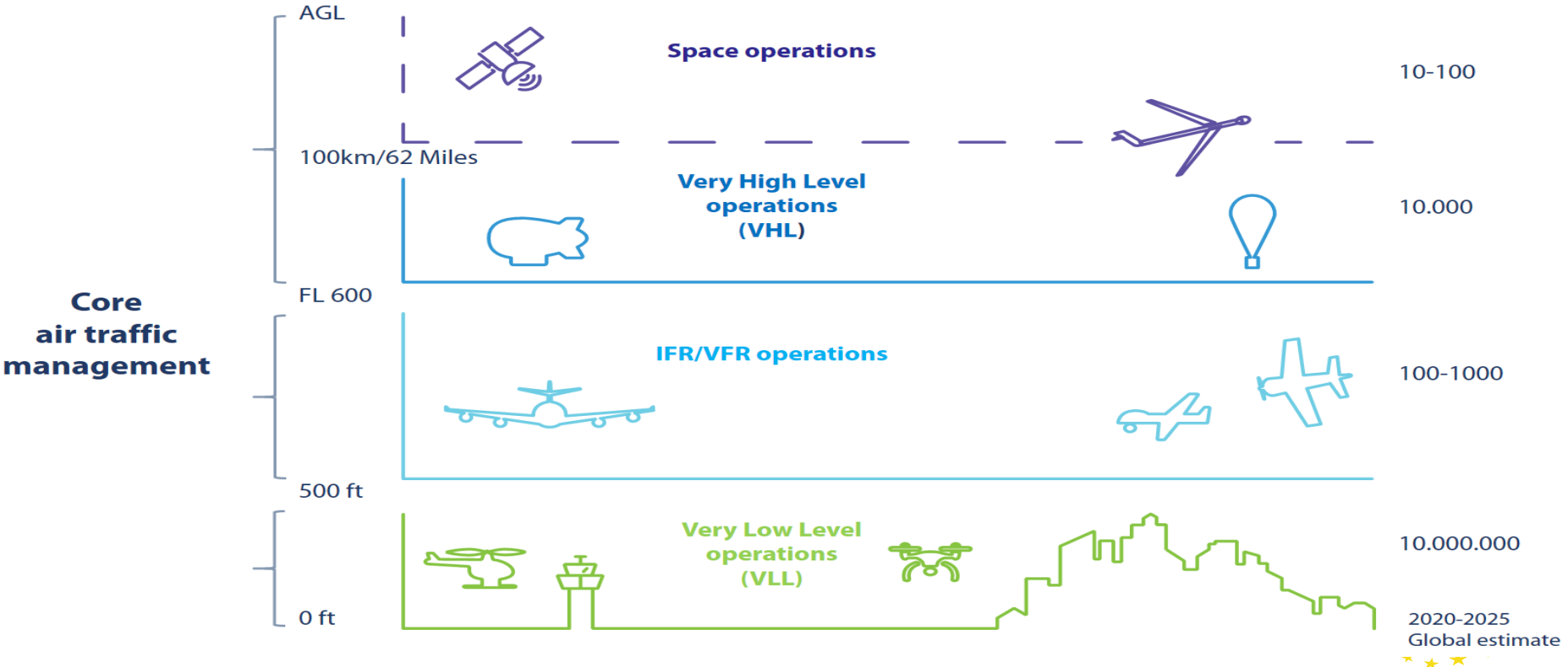
13 November 2019



U-space



# Number & diversity of air vehicles are increasing



# U-space is...



- New set of **digital and automated** data services
- **Safety**: dynamic geo-fencing, management of emergencies & contingencies
- **Interface** with conventional aviation
- **Highly automated** vehicles equipped with D&A and using V2X communication
- Drones like any other **IoT** device: leveraging mobile and satellite communication networks
- **Security**: registration, authentication, Secure

Service Oriented	Safety Focused	Standard-based	Open
Modular	Interoperable	Technology agnostic	Based on evolutionary development
Automated	Allowing variants	Deployment agnostic	Securely designed

# Services offering progressive increase in automation and connectivity



**European ATM Master Plan:**  
Roadmap for the safe integration of drones into all classes of airspace

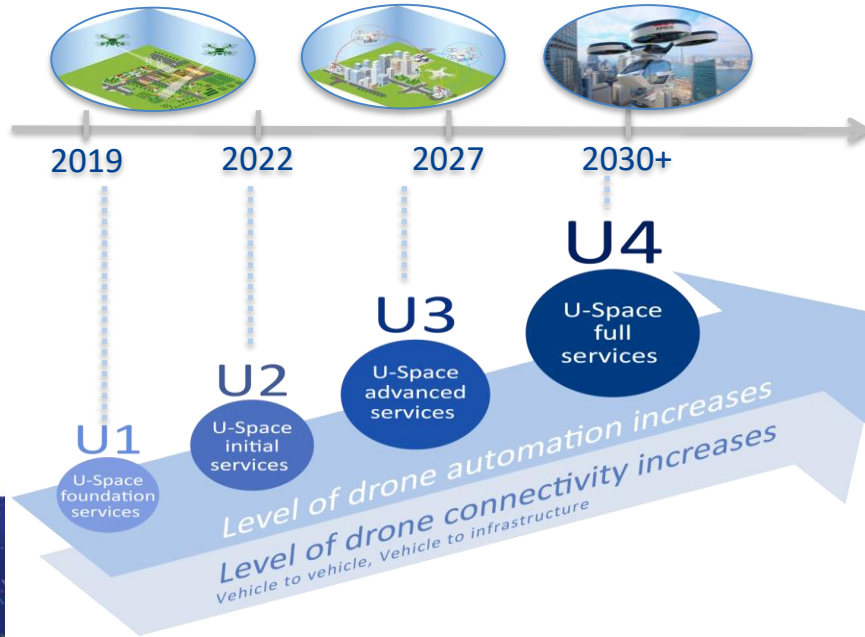


**U-space**

**Blueprint**



# U-space



**U1**

**Foundation**

- e-registration
- e-identification
- geofencing

**U2**

**Initial**

- planning & approval
- tracking
- airspace dynamic information
- procedural interface with ATC

**U3**

**Enhanced**

- capacity management
- assistance for conflict detection

**U4**

**Full**

- integrated interfaces with manned aviation
- additional new services



## U-space in SESAR

# U-space



+ €33 million  
funding



125 legal  
entities



19  
projects



2 years

# Research and demonstration project portfolio

Concept of Operation

- CORUS

Security & cyber-resilience

- SECOPS

Drone information management

- IMPETUS
- DREAMS

Ground based technology

- CLASS
- TERRA

Sense & avoid

- Percevite

Datalink

- Droc2om

Aircraft systems

- AIRPASS

Project	Country	Environment	Area survey	Parcel delivery	Linear survey	Point survey	UAM	Leisure	Emergency / SAR	External
DIODE		-Rural -Sub-urban -Airport	-Agriculture -Archaeo -Road traffic	Ad-hoc	Electricity rail	-On airport -Photography	n/a	Yes	-Firefighting -SAR	-Manned a/c -ATC -V21
DOMUS		-Rural -Urban -Maritime -Airport	-Terrain -Construction -Road traffic -Maritime patrol	-Medical -Urgent delivery	n/a	-3D modelling -Building inspection	n/a	Yes	-Firefighting -Road traffic accident	-Manned a/c -ATC -V21
EuroDRONE		-Urban -Airport	No	-Commercial	-Long distance utility	-On airport	n/a	Yes	n/a	-V2V -V21 -ATC
GOF		-Urban -Maritime -Forestry -Airport	-Drone fleet management	-International parcel delivery	-Long-range sensory data collection 100km+	-Drone fleet management	Air taxi form airport to city centre	Yes	-Maritime traffic surveillance -SAR -Police	-Manned a/c -ATC
SAFIR		-Urban -Airport	-Inspection for Port Authorities	-Commercial -Medical	-Oil spill -High tension line	-Line incident intervention and Pylon inspection	n/a	Yes	-Port inspection on criminal offenses	-Manned a/c -ATC -V2V -V21
VUTURA		-Rural -Urban	-Agriculture	-Commercial	n/a	n/a	n/a	Yes	-Drone interception -Firefighting -Police	-Manned a/c -ATC
GEOSAFE		-Rural -Urban	-Agriculture	-Commercial	n/a	-On airport -Security surveillance	n/a	Yes	-Police	-ATC -V2V -V21
PODIUM		-Rural -Urban -Airport	-Agriculture	-Commercial -Urgent delivery	n/a	-On airport -Security surveillance	n/a	Yes	-Police -SAR	-Manned a/c -ATC
SAFEDROME		-Rural -Sub-urban -Airport	-Agriculture -Drone fleet management	-Commercial	n/a	-Drone fleet management	n/a	Yes	n/a	-Manned a/c -ATC -V2V -V21
USIS		-Rural -Sub-urban -Urban -Airport	-Agriculture	-Point to point -Multi-points	-Border surveillance	-Security surveillance	n/a	n/a	-SAR	-Cross-border operations -ATC -V21

## U-space demo coverage

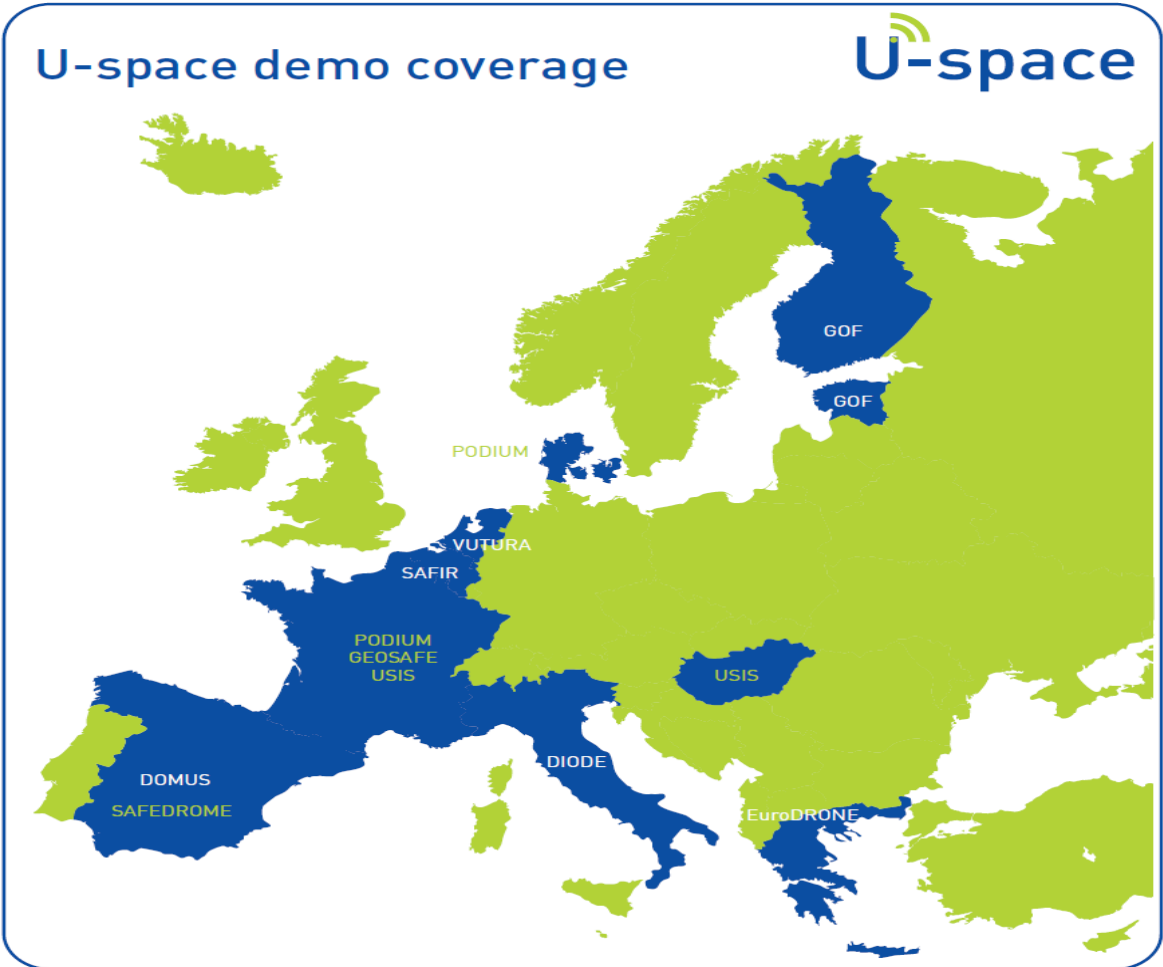


**NEW DEMOS**

- DIODE
- DOMUS
- EuroDRONE
- GOF
- SAFIR
- VUTURA

**EXISTING DEMOS**

- GEOSAFE
- PODIUM
- SAFEDROME
- USIS



# PODIUM

## Proving Operations of Drones with Initial UTM

U1

U2

U3



### BRETIGNY – enhancing business operations

- 5 scenarios
- 100+ flights
- Reserved Zone
- **CTR vicinity**
- VLOS, BVLOS

### ODENSE – Regular drone usage and interoperability with manned aviation

- 5 scenarios
- 45 flights
- Restricted airspace
- Class G, TIZ, AFIS
- **VLOS, BVLOS**

Commercial, urgent delivery & agricultural missions

### RODEZ - entering/exiting CTR, ATCO interactions

- 5 scenarios
- 10 flights
- Class D CTR
- **BVLOS**
- C2 loss...

### MARKNESSE & EELDE – “unexpected” scenarios

- 3 scenarios
- 30 flights
- Class C CTR
- **VLOS, BVLOS**
- Priority, diversion







Environment	Area survey	Parcel delivery	Linear survey	Point survey	UAM	Leisure	Emergency / SAR	External
-Rural -Sub-urban -Urban -Airport	-Agriculture	-Point to point -Multi-points	-Border surveillance	-Security surveillance	n/a	n/a	-SAR	-Cross-border operations -ATC -V21

The project aims to demonstrate services with a special focus on **e-identification** and **registration**, **surveillance** and **tracking**, **scheduling**, and **dynamic airspace management** (including generation and management of no-fly/restricted zones).

The main demonstration objective is to show the services are capable to support all **BVLOS operations**, all EASA's categories of drones, and **all population densities**.

THALES

dgac  
DSNA

DFS Deutsche Flugsicherung

HungaroControl  
Straight to the point

ALTA METRIS

UNIFLY

ENAC  
ECOLE NATIONALE DE L'AVIATION CIVILE

SESAR  
JOINT UNDERTAKING

# GeoSAFE

## GEOfencing for Safe and Autonomous Flight in Europe

U2

U3

GEO SAFE

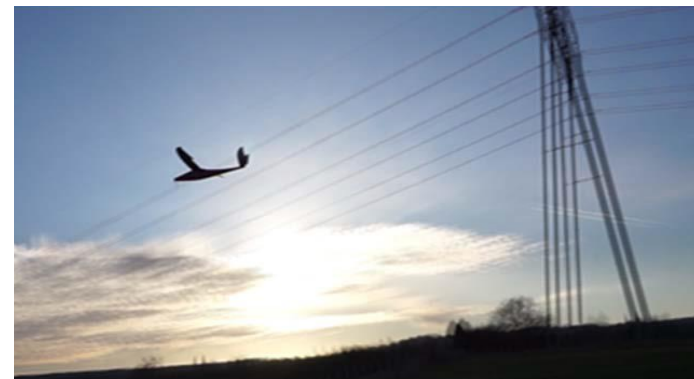


To establish state-of-the-art of existing geofencing solutions regarding the 3 U-space level:

- **Pre-tactical geofencing**
- **Tactical geofencing**
- **Dynamic geofencing**



- 290 tests (rural and urban environments) near restricted areas/within a geofenced volume/in degraded environment
- 16 drones
- 18 mission planners
- 7 objectives to test



THALES

SPH ENGINEERING  
SMART FLIGHTS & HELICOPTERS



GEO SAFE

AEROMAPPER  
AERIAL PHOTOGRAPHY & MAPPING

techsys

SESAR  
AIRMAP MAKING

# VUTURA

## Validation of U-space by tests

The demonstration is showing **multiple U-space service providers** can cooperate in a same geographical area.

### Missions:

- Agricultural surveillance
- Surveillance of a nuclear power plant
- Leisure
- Package delivery
- High priority drone for medical emergency delivery



City of  Enschede



**AIRMAP**



UNISPHERE



# GOF USPACE

## Finnish-Estonian "Gulf of Finland" very large U-space demonstration

U2

U3



The demonstration is showing that a **federation of U-space service provider micro-services** is relevant to collectively manage all drone traffic in the same geographical region.

Aims to establish a **pre-operational Flight Information Management System (FIMS)** with an architecture capable of integrating existing commercial-off-the-shelf UTM components.



Demonstration series will be completed by an urban Volocopter **air taxi flight** from the Vantaa international airport at the **end of August 2019**.



Urban drone fleet ops in Helsinki with Police intervention



Co-operation with Search and Rescue forces and general air traffic (GA)



Maritime traffic surveillance combined with border guards over Gulf of Finland



International parcel delivery between Helsinki and Tallinn



Urban drone fleet ops in Tallinn in controlled airspace



100km+ inspection flights in forestry and utility inspection

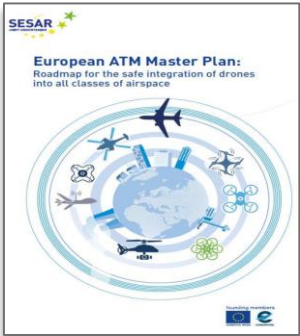


Urban Air Mobility flight from Helsinki-Vantaa airport to downtown Helsinki

# U-space timeline



June 2017



Feb 2019



September 2019

## Programme consolidation

(up to Feb. 2020)

**Demonstrations preparation**  
*10 projects*

**Flight trials**

**Conclusions**

**Other U-space project project deliverables**  
*9 projects, more than 100 technical deliverables*

2018

Oct.

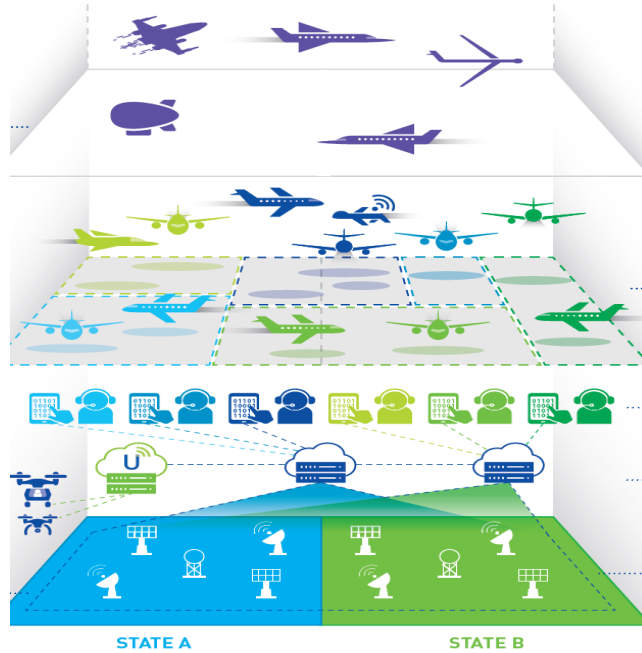
Jan.

Apr.

Jul.

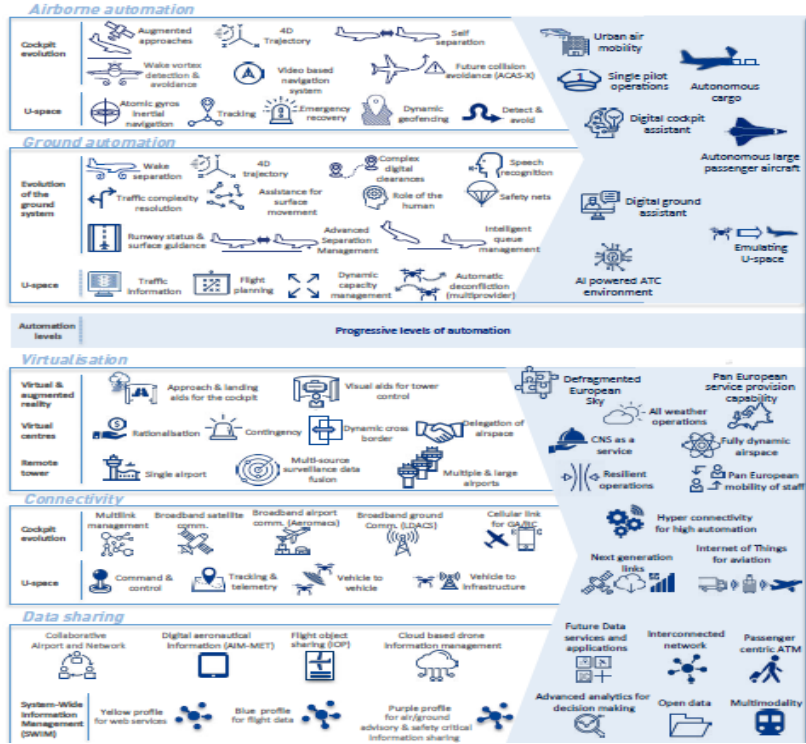


# Towards a Digital European Sky



## SESAR Solutions (delivered/in the pipeline)

## Future innovations



New standards for safety and security



# Thank you!

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U-space

