

S2020 CORUS XUAM 2nd Workshop

Demonstration exercises Italy with a focus on ATM/U-space interface
and relevant U-space services

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Luigi Brucculeri – D-Flight -
16 March 2022**

Exercise Description and scope


The WP8 Italian demonstration, focuses on guidelines for **safe depot-to-depot operations between two logistics centres** within a suburban area.

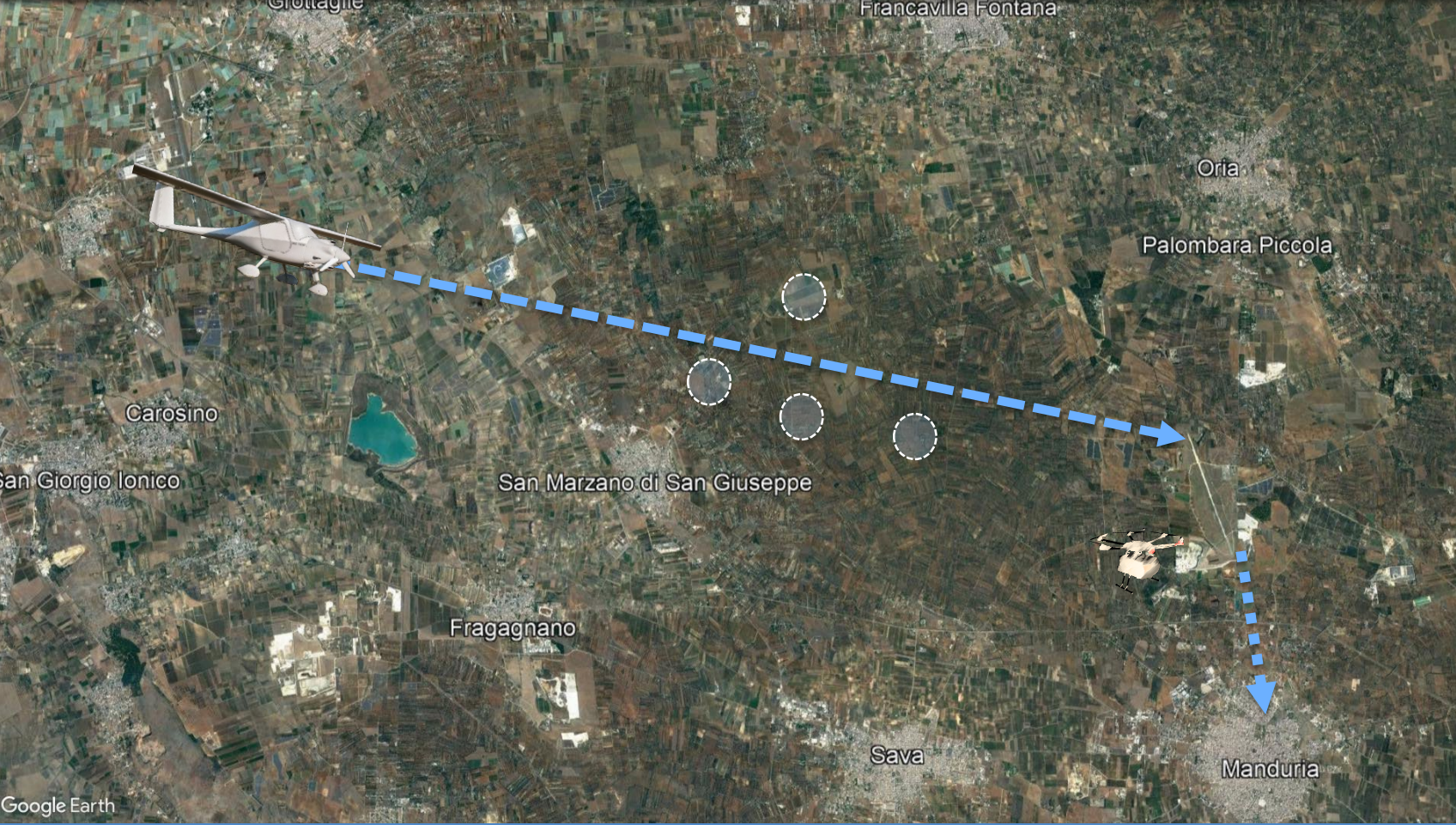
Flights, with involvement of a fast **UAM vehicle and other drones for specific operations**, will take place at Grottaglie-Taranto civil experimental airport, allowing the involvement of an **ATM + U-Space** component and the demonstration of **coordination and interoperability between ATM and U-space for the management of UAM traffic**.

This VLD addresses a UAM-tailored performance framework including **safety, access and equity, cyber security and human performance**, measured through humans-in-the-loop assessment, such as ATCOs and pilots, during the demonstration.

ENAV-D-Flight-TECHNO SKY-NAIS-DTA-PIPISTREL

Scenario

 **Italian VLD: Medical cargo transportation in U-space with UAM RPAS and drone**



Google Earth

Involvement of ENAV for ATM and USP D-Flight for UTM Coordination for operations

STEPS

1. Vaccine/Medical goods arrive at Grottaglie Airport

2. Vaccine/Medical delivery with Pipistrel UAM Cargo to Manduria Airfield
Distance 20 km

3. Drones for precision farming and photogrammetry/inspection operations

4. Last mile delivery with small drone
Distance 6 km

Italian VLD: Medical cargo transportation in U-space with UAM RPAS and drone

Demo Steps (Concept)	
1	1A. A cargo (e.g. medical goods/Vaccine) arrives at Taranto Grottaglie Civil Airport. 1B. The medical content is loaded on a Pipistrel (PVS) Large Fixed Wing Cargo UAS/RPAS placed in an area close to the airport.
2	The PVS/RPAS starts the mission and fly in U-space through a planned UAM Corridor which ends in an area (logistic center) close to Manduria.
3	During the flight other drones operations are performed and managed in the U-space.
4	4A. Once the PVS/RPAS has landed in the airfield, the medical loads is divided into several smaller loads. 4B. One of these, is loaded on a Techno Sky UAS and transported to final destination (Manduria City Hospital) through a specific BVLOS operation.
5	Before the return flight to Grottaglie of the PVS/RPAS (before Take-off), an emergency occurs (an HEMS flight starts in controlled airspace that execute operation in U-space. The emergency is managed at all levels.



Phases

- **Strategic:** any general activities related to the management of UAM and independently to the single flight: there are encompassing registration, publication of UAM Corridor, operational authorization of UAM.
- **Pre flight:** Any activity related to the preparation of the flight prior to departure, including vehicle pre-flight checks, vehicle charging, flight planning, boarding passengers and/or cargo
- **Departure:** the period in which the UAM vehicle physically departs from the location A (Vertiport, stand, runway, airfield etc) up to the point at which it reaches cruise altitude. Departure includes taxi, take-off and initial climb
- **En route:** The point at which the vehicle reaches cruise altitude up to the point at which it begins the approach to the destination location/point (Vertiport, stand, runway, airfield etc)
- **Approach :** the period between the UAM vehicle aligning with the optimal track to the assigned destination and reaching the decision point (or decision altitude/flight). Descent is expected to occur within this phase. The UAM pilot will elect to either continue or land or climb to a safe maneuvering altitude (executing a missed approach)
- **Landing:** the point at which the decision is made to continue to the destination from the decision point (or decision altitude/height) until the UAM vehicle lands
- **Post flight:** the period after the UAM vehicle stops moving, the flight closes and securing the vehicle commence. Post flight activities typically includes de-boarding passengers and/or cargo and vehicle servicing activities



Actors



USP Operator/Support Desk



Vertiport/airfield entity



TWR/Gnd Controller



ANSP



Flight Information Service Officer



Competent Authority



UAM Remote Pilot

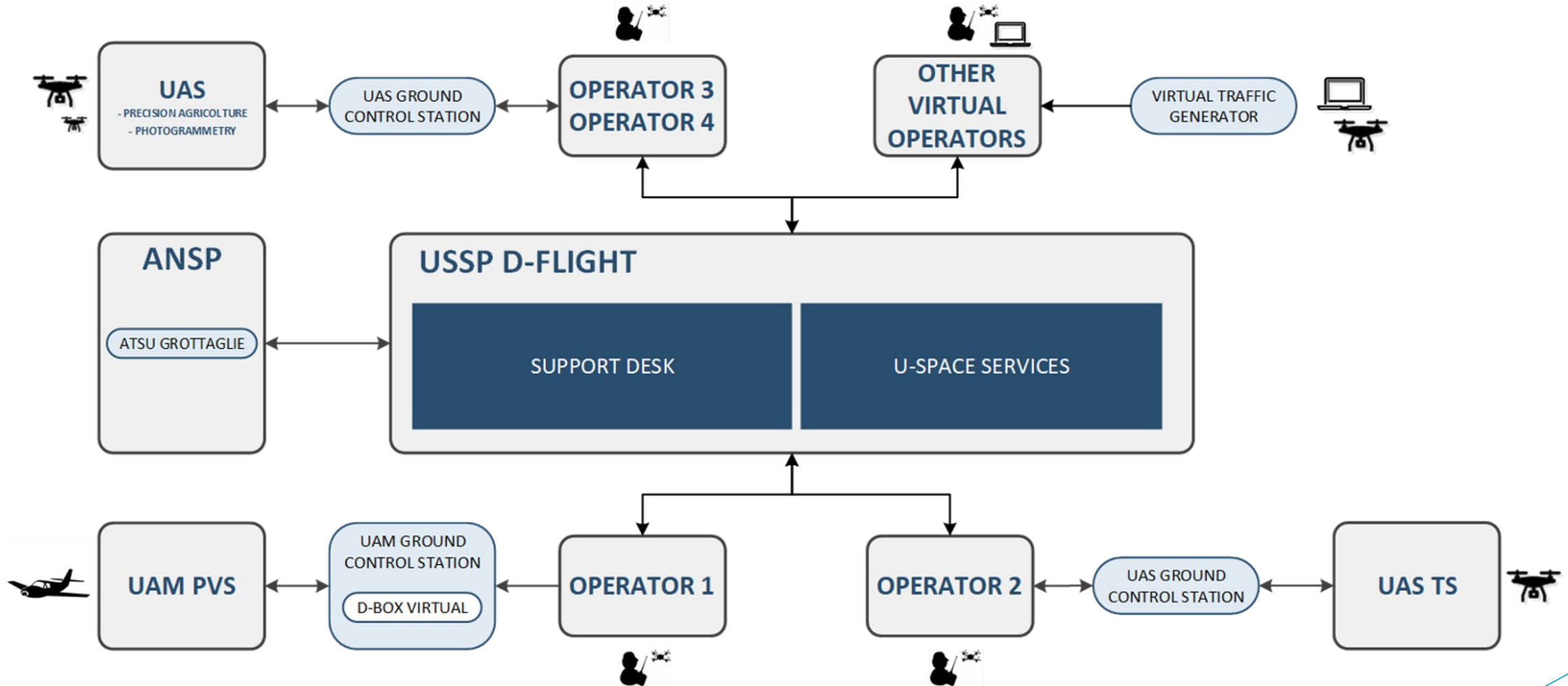


Drone Pilots



USP System

Architecture



Systems and Veichles under test

PVS Fixed Wing Cargo RPA + RPS (with safety pilot on board)



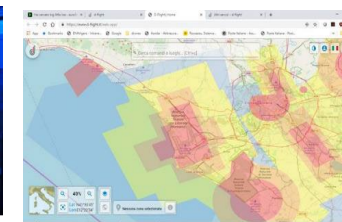
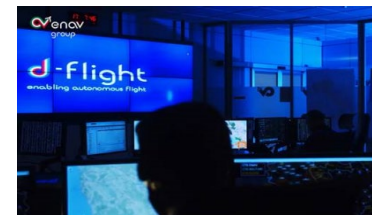
Techno Sky UAS adapted for small cargo delivery (BVLOS operation)



Opportunity UAS traffic



D-Flight USP system +DJI AeroScope (to support identification) + drone traffic generator (for virtual drone traffic)

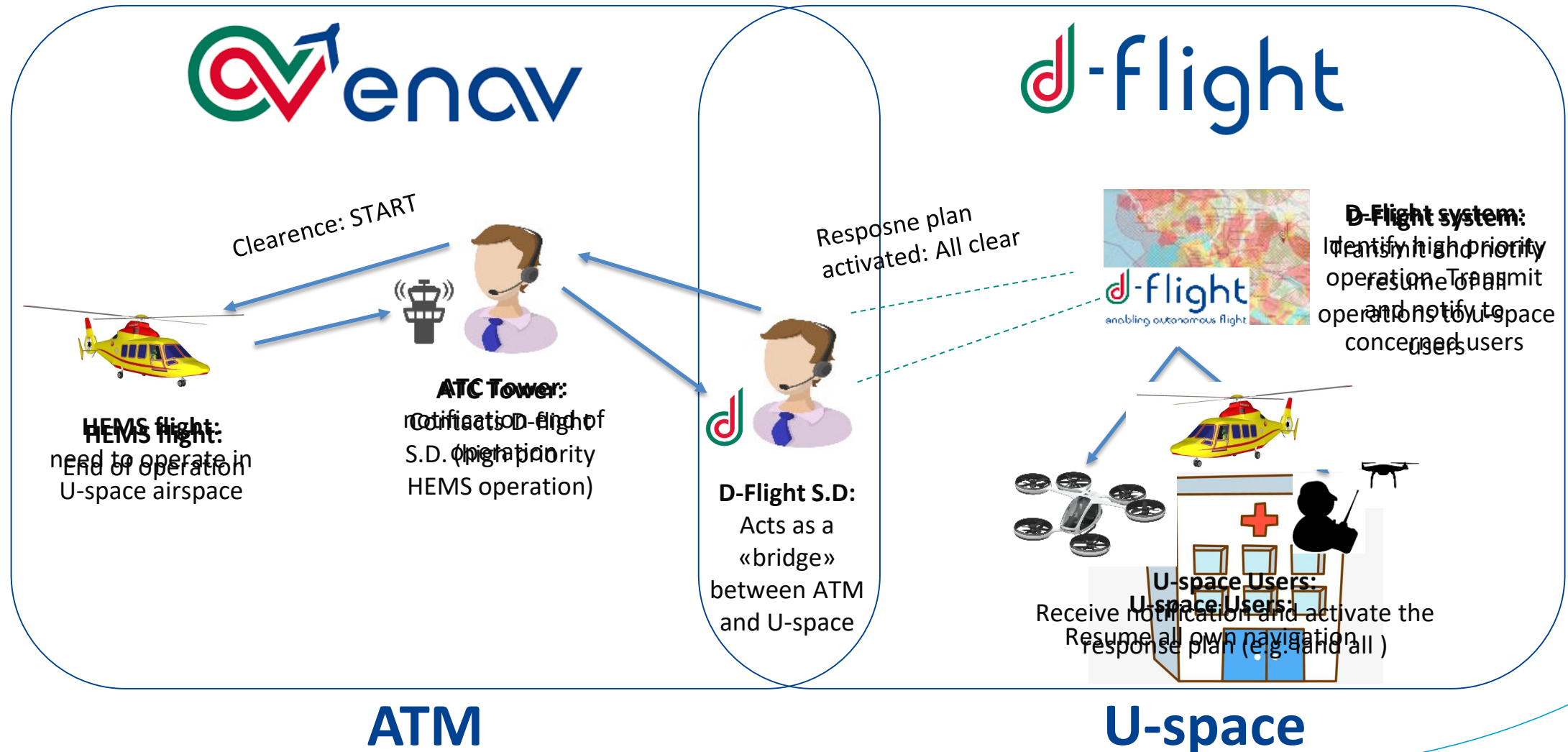


Location: Taranto Grottaglie Airport + Manduria Airfield +Manduria Hospital



ATM/U-Space coordination and interoperability: "the italian job"

- **Objective:** management of "high priority" HEMS flight operation originated in ATM and executed in U-space.
- **How:** Accommodation of operation. Use of a human actor "D-flight support desk" acting as a bridge between ATM and U-space



D-Flight services

Mandatory Services

NETW. E-IDENTIFICATION

Allows continuous processing of remote UAS identification for the entire duration of the flight (registration number, UAS ID, UAS position and direction, remote pilot position, emergency status, timestamp).

- Hook-on device
- Plugin in GCS.
- Networked DRI - Antenna
- D-flight APP



TRAFFIC INFORMATION

Contains information on any additional visible air traffic that may be in the proximity of the UAS flight's intended location or route.

It includes the position, the time of the report, as well as the speed, route or direction and the state of emergency of the aircraft, if known.

- Cooperative unmanned traffic with NRIs.
- Manned ADS-B / FLARM traffic detected by commercial terrestrial networks (e.g. Flightaware).
- Traffic manned with NRI conspicuity (i.e. with active d-flight app - aviator profile).
- Non-cooperating local unmanned traffic
- Link with ATSU for manned traffic in ATZ / CTR.

GEOAWARENESS

- UAS geographical areas relevant for U-space airspace – static and dynamic.
- Temporary restrictions applicable to the use of airspace within U-space airspace.
- Provides strategic and tactical information.
- It aims to support the operator in the strategic part of planning, identifying the requirements with which it must be compliant in order to operate.
- It is the basis for services such as FA, DOA or DOP.

FLIGHT AUTHORIZATION

DOA and DOP services allows with different capability level to enter a Drone Operation into the system to acquire flight authorization.

From the UAS operator point of view, the solution already carries out the two stages:

- ✓ flight authorization (request and authorization) and
- ✓ activation (request and activation).

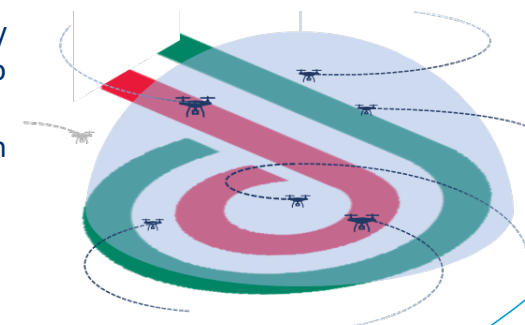
Support Desk for coordination with ATS entities:

- ✓ operation letter between ATSU-UASOp – agreed working methods and procedure for nominal/non nominal cases.

OTHER SERVICES

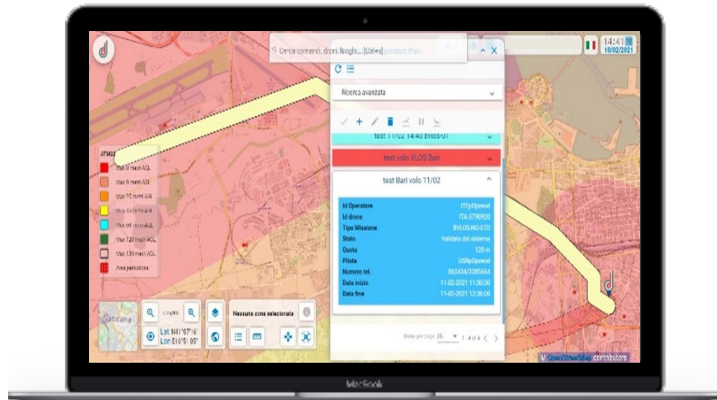
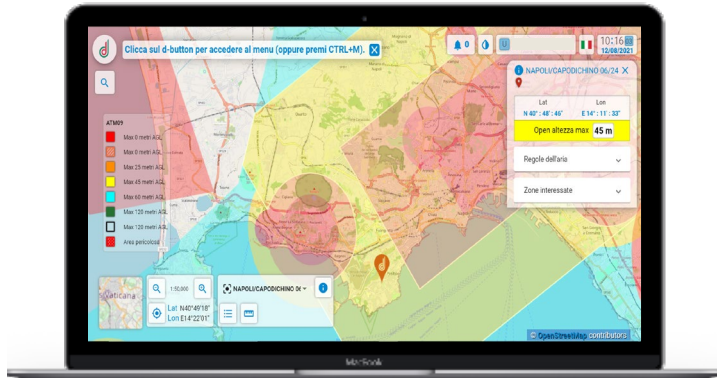
In order to ensure safe operation in a given U-space airspace, other U-space services, such as the weather information service, conformance monitoring

U-Space bubble



D-Flight services

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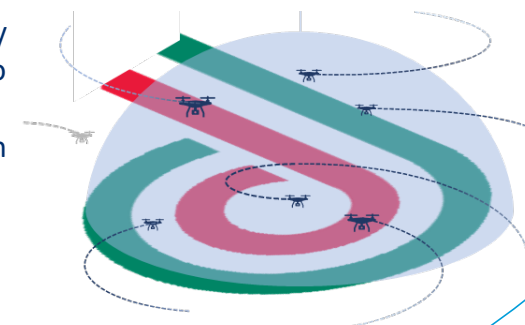
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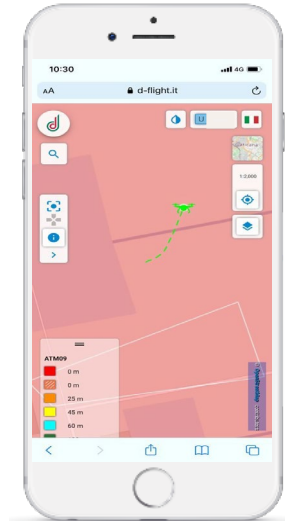
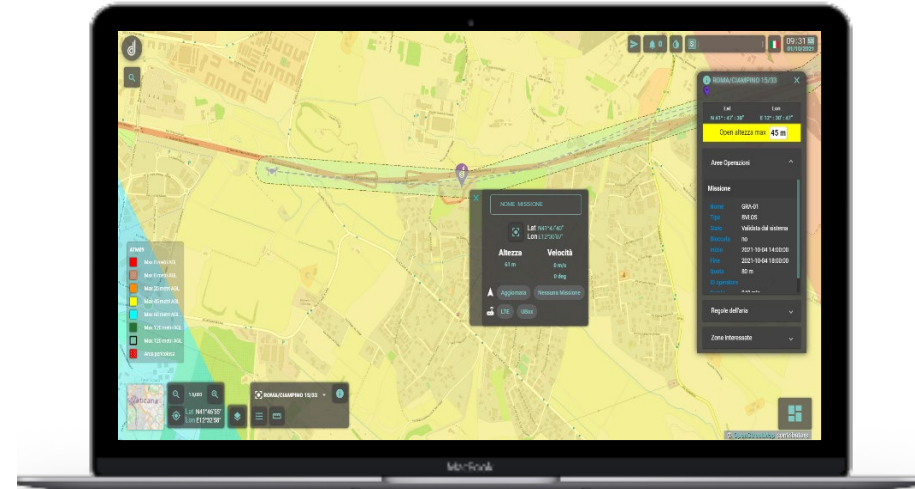


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Registration and fleet management

New UAS - User: CORUS XUAM Test User

Filter criteria

Sort criterion: UAS name

Add New Uas

Basic Info

UAS name *
Pipistrel

UAS Manufacturer *
Pipistrel

UAS Manufacturer Model *
Amazilia X908

Status *
ACTIVE

MTOM (Kg) *
670

Items per page: 25

Fleet - User: CORUS XUAM Test User

Filter criteria

Sort criterion: UAS name

drone1 DJI Mavic 2 Pro Tag: ITA-5407367	Pipistrel
drone1 DJI Mavic 2 Pro Tag: ITA-7630647	
Pipistrel Amazilia X908 Tag: ITA-5479812	

Click to add a new UAS. +

Items per page: 25

Basic Info

UAS name
Pipistrel

UAS Manufacturer
Pipistrel

UAS Manufacturer Model
AGRAS MG-1

Status
ACTIVE

MTOM (as reported in Project Config) (kg)
Amazilia X908

MTOM (kg)
670

Flight Controller
1234567

OS
345678

APN
12345678

Insurance Company

Insurance Name

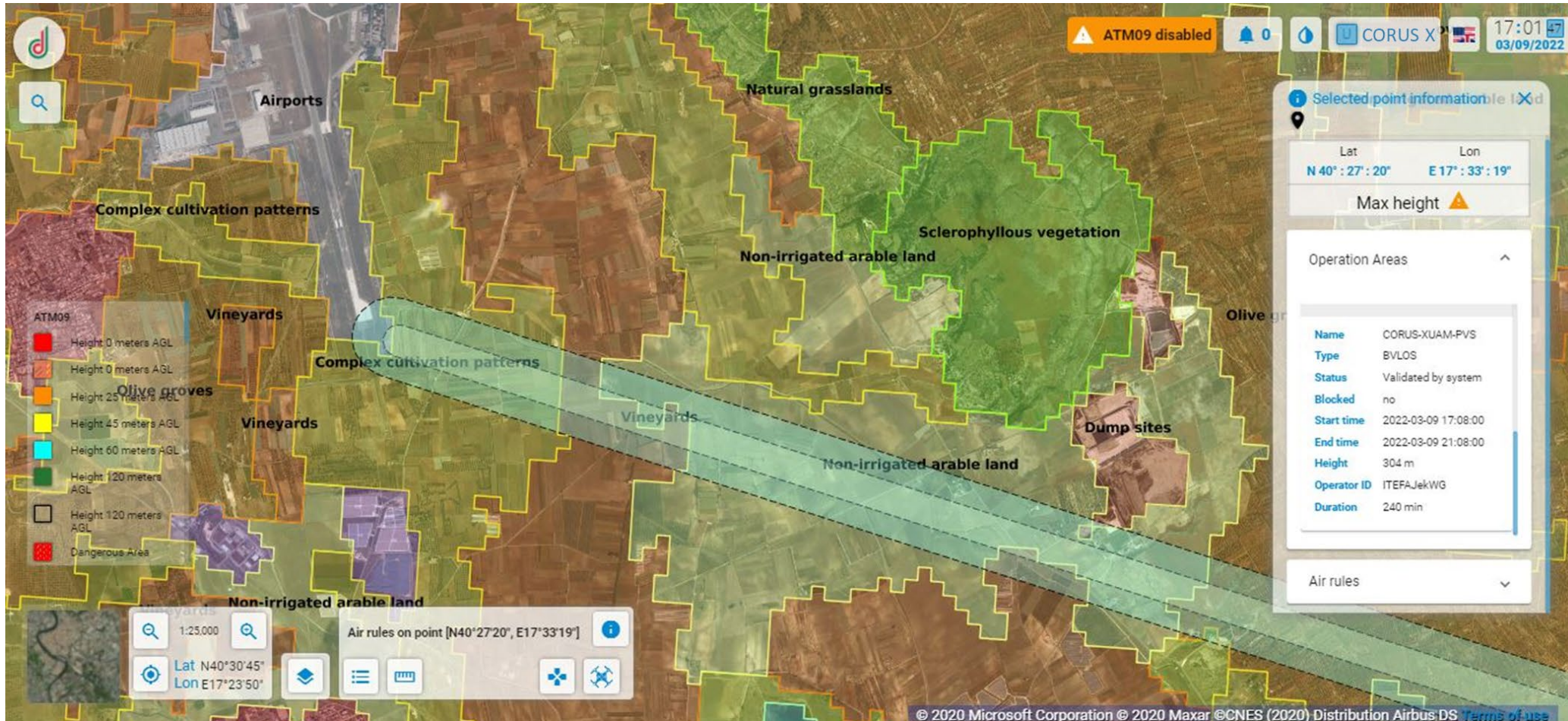
Insurance ID

Insurance Expiry Date

Close

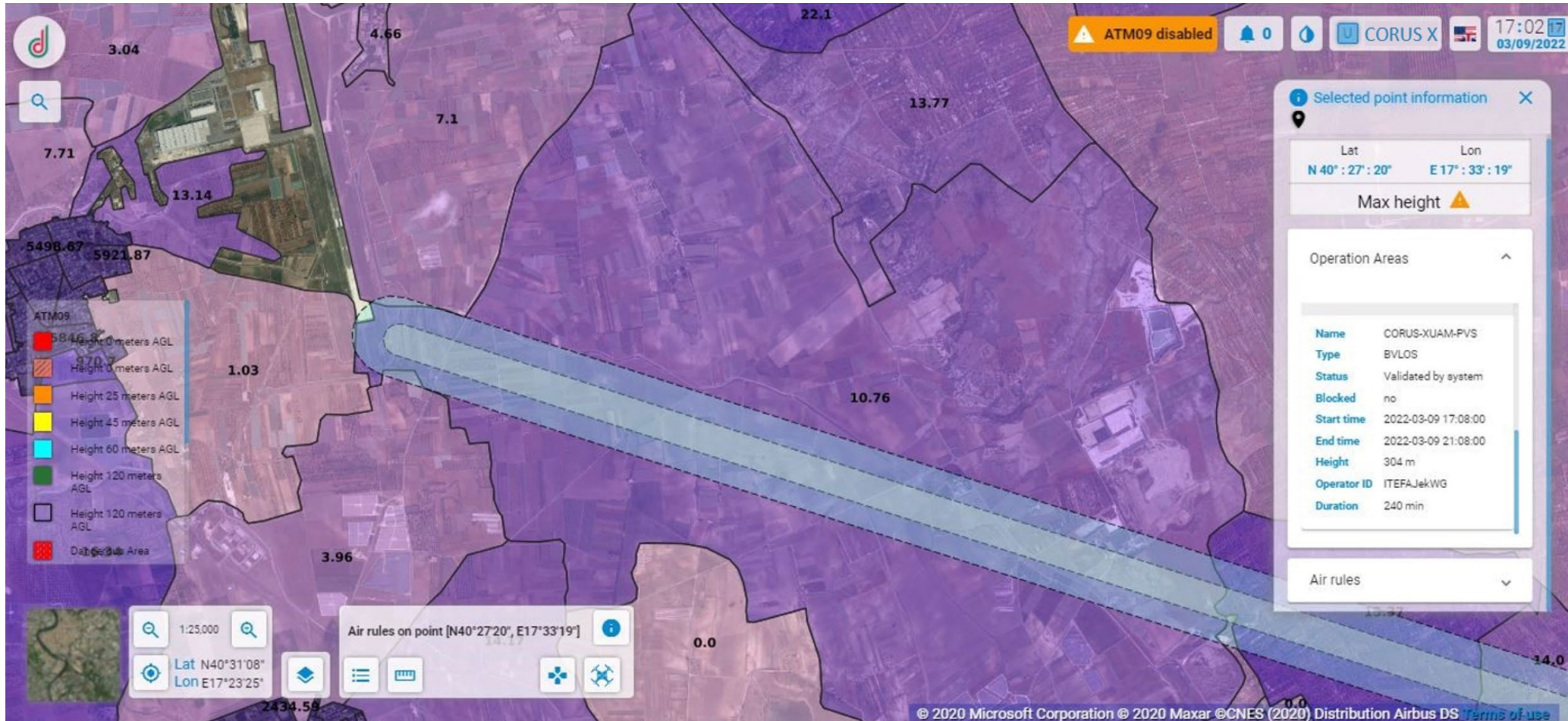
U-space services views

UAM Corridor + Land Use Layer near Grottaglie Airport



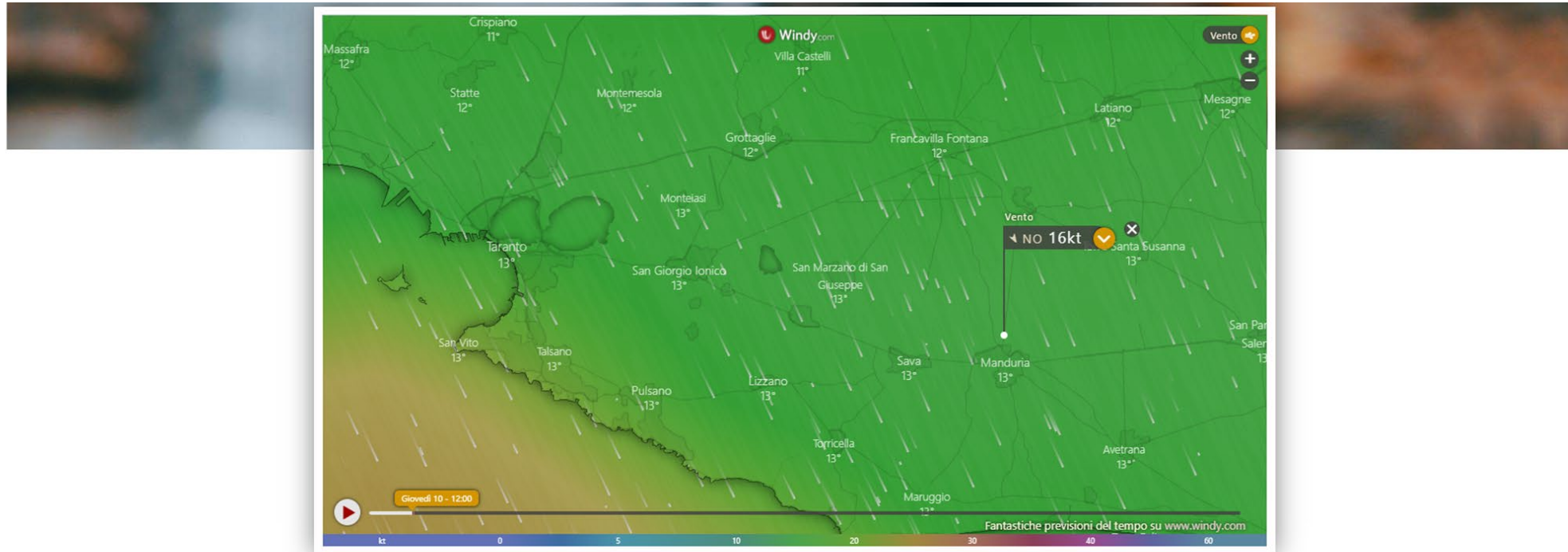
U-space services views

UAM Corridor + Population Density map (n° in/Km²) Layer



U-space services views

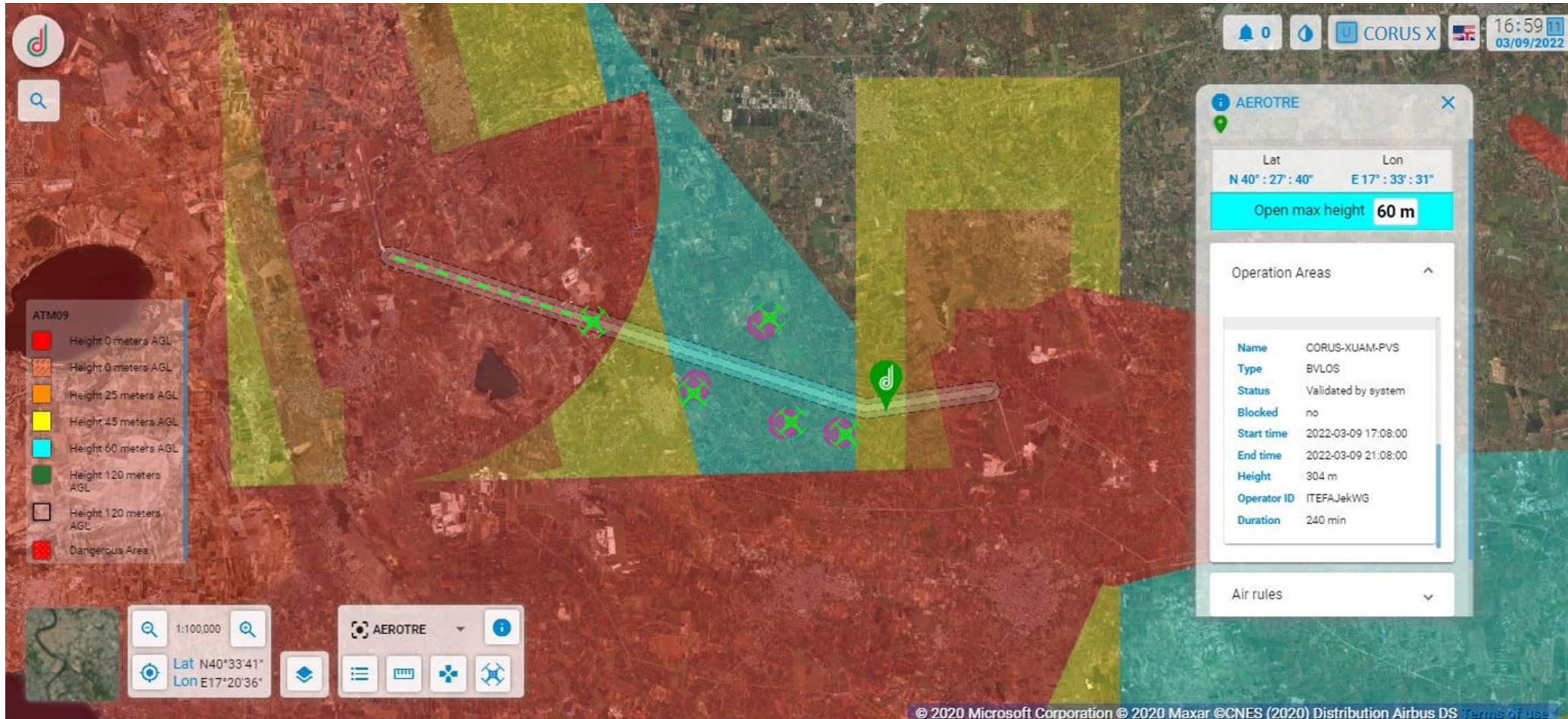
D-Flight website: Weather Service – Grottaglie Area



The screenshot shows the footer of the D-Flight website. On the left is the 'd-flight' logo with the tagline 'enabling autonomous flight'. In the center is the 'Info & services' menu with links to Home, Services, Prices, Regulations, and Weather. On the right is the 'Follow us on' section with social media icons for Twitter and LinkedIn, and a tweet preview from @D_Flight_SpA.

U-space services views

Missions Demo



The screenshot displays the AEROTRE U-space services interface. The main map shows a flight path (green dashed line) over a terrain with various colored zones (red, orange, yellow, cyan, green). A legend on the left, titled 'ATM09', defines these zones by height above ground level (AGL):

- Red: Height 0 meters AGL
- Orange: Height 0 meters AGL
- Yellow: Height 25 meters AGL
- Cyan: Height 45 meters AGL
- Green: Height 60 meters AGL
- Light Green: Height 120 meters AGL
- Dark Green: Height 120 meters AGL
- Red with diagonal lines: Dangerous Area

The flight path starts at a green location marker and moves through the zones. A detailed information panel for the 'AEROTRE' mission is open on the right, showing the following data:

AEROTRE	
Lat	Lon
N 40° : 27' : 40"	E 17° : 33' : 31"
Open max height 60 m	
Operation Areas	
Name	CORUS-XUAM-PVS
Type	BVLOS
Status	Validated by system
Blocked	no
Start time	2022-03-09 17:08:00
End time	2022-03-09 21:08:00
Height	304 m
Operator ID	ITEFAJekWG
Duration	240 min
Air rules	

The interface also shows a scale of 1:100,000, current coordinates (Lat N40°33'41", Lon E17°20'36"), and a timestamp of 16:59 on 03/09/2022. The bottom of the screen contains copyright information: © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS Terms of use.

THANK YOU FOR
YOUR ATTENTION