

# Motorflygkonferens Tekniska museet

lördag 23 september 2023



Morgondagens teknik finns redan i dag

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# The Development of the Mobile Industry



1990



Global voice calls  
and SMS

2000



Mobile broadband

2010



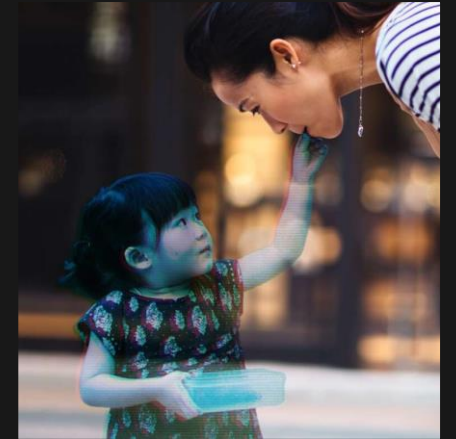
App economy

2020



Digitalization of  
societies and industries

2030



Cyber-physical interaction  
- the immersive experience

# 1,000,000x

Data Speed Increase in 30 years

# 5G is set to become the dominant access technology



**239**  
Live 5G networks  
including 35 standalone  
(GSA May 2023)

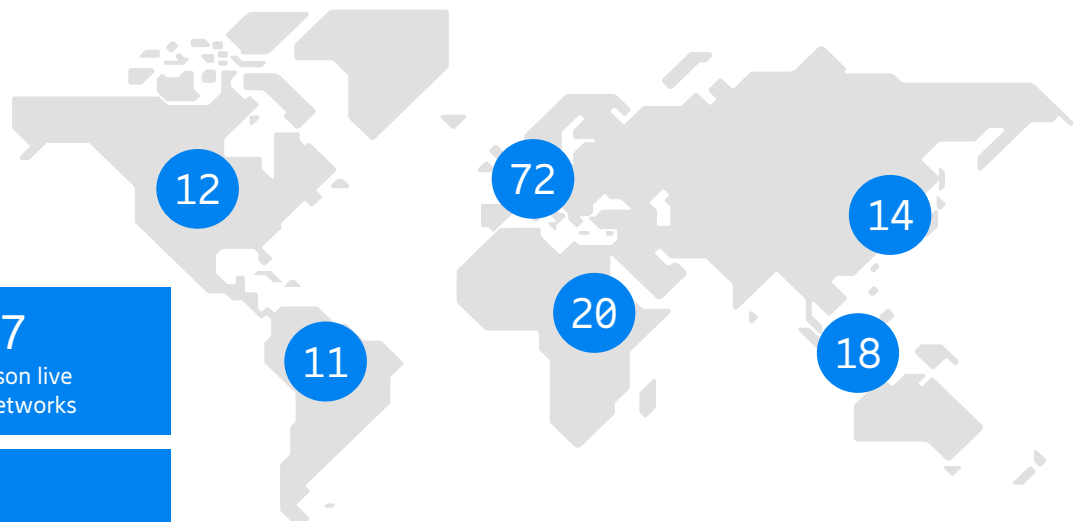
**1 bn**  
5G mobile subscriptions  
was around 1 billion at  
the end of 2022

**>35%**  
5G population coverage  
at end of 2022  
(Ericsson June 2023)

**29GB**  
Average Monthly mobile  
data traffic per sub  
South Korea (March 2023)

**79%**  
Of traffic on  
5G network  
South Korea South Korea  
(March 2023)

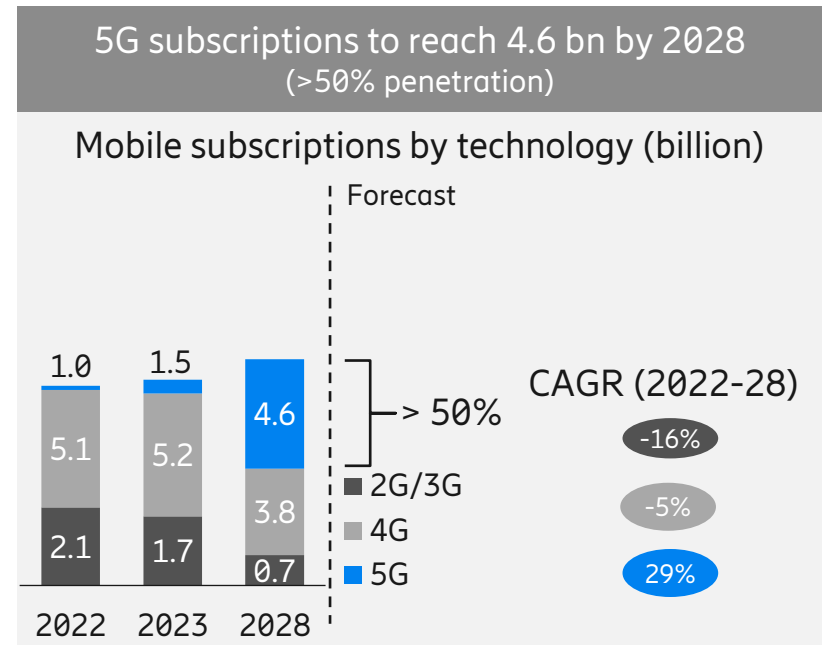
Ericsson live 5G networks: 147 globally



**147**  
Ericsson live  
5G networks

**24**  
Ericsson live 5G  
standalone networks

● Ericsson live networks  
\*As of May 2023





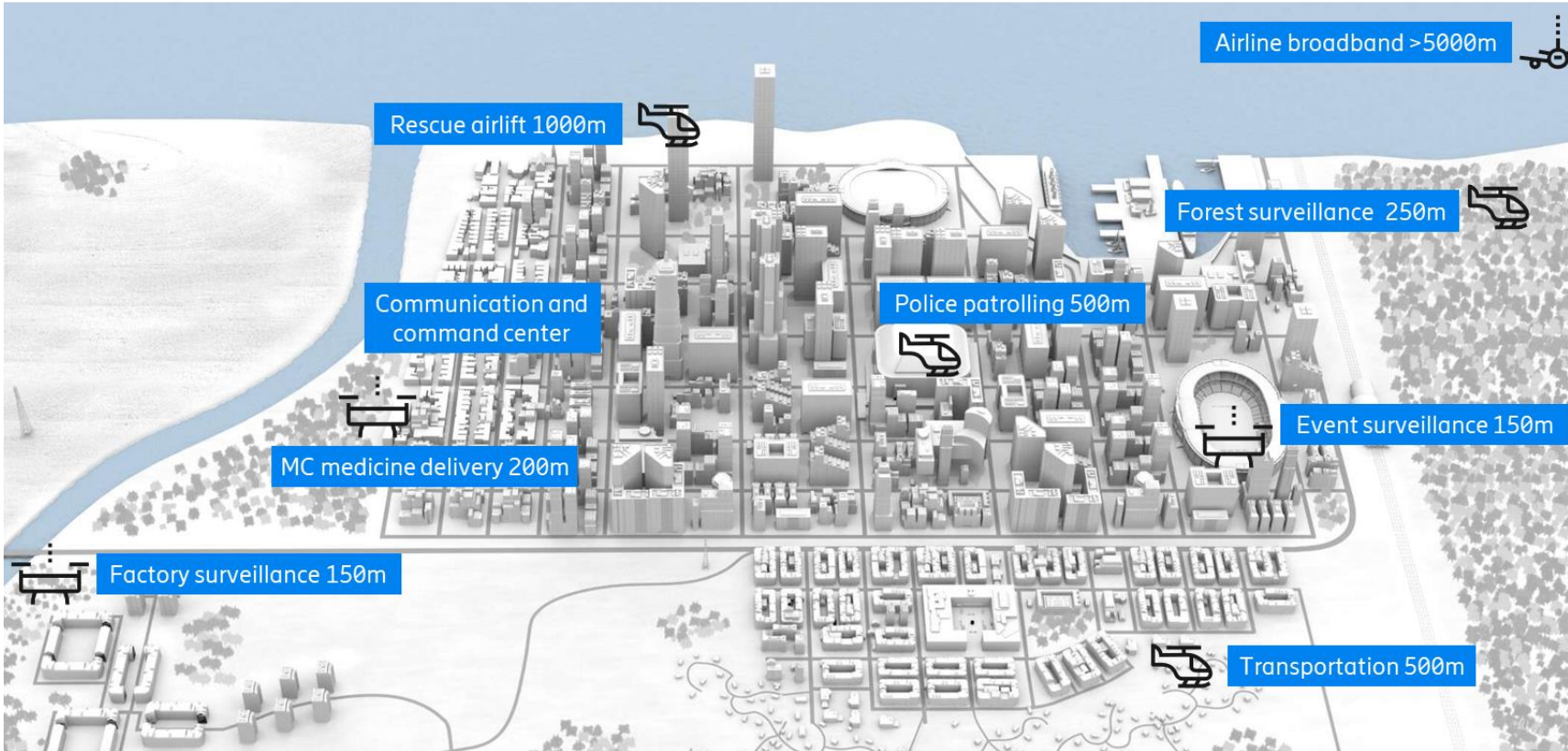
# Ericsson Digital Airspace





# Digital Airspace

Mission Critical Networks expansion



Mission Critical 3GPP networks provide efficient means of communication for main stakeholders in the aviation industry. Key benefits are

- Reliable
- Secure
- Wide-Area and Local Coverage
- High-Bandwidth
- Future proof.

Main use cases supported are

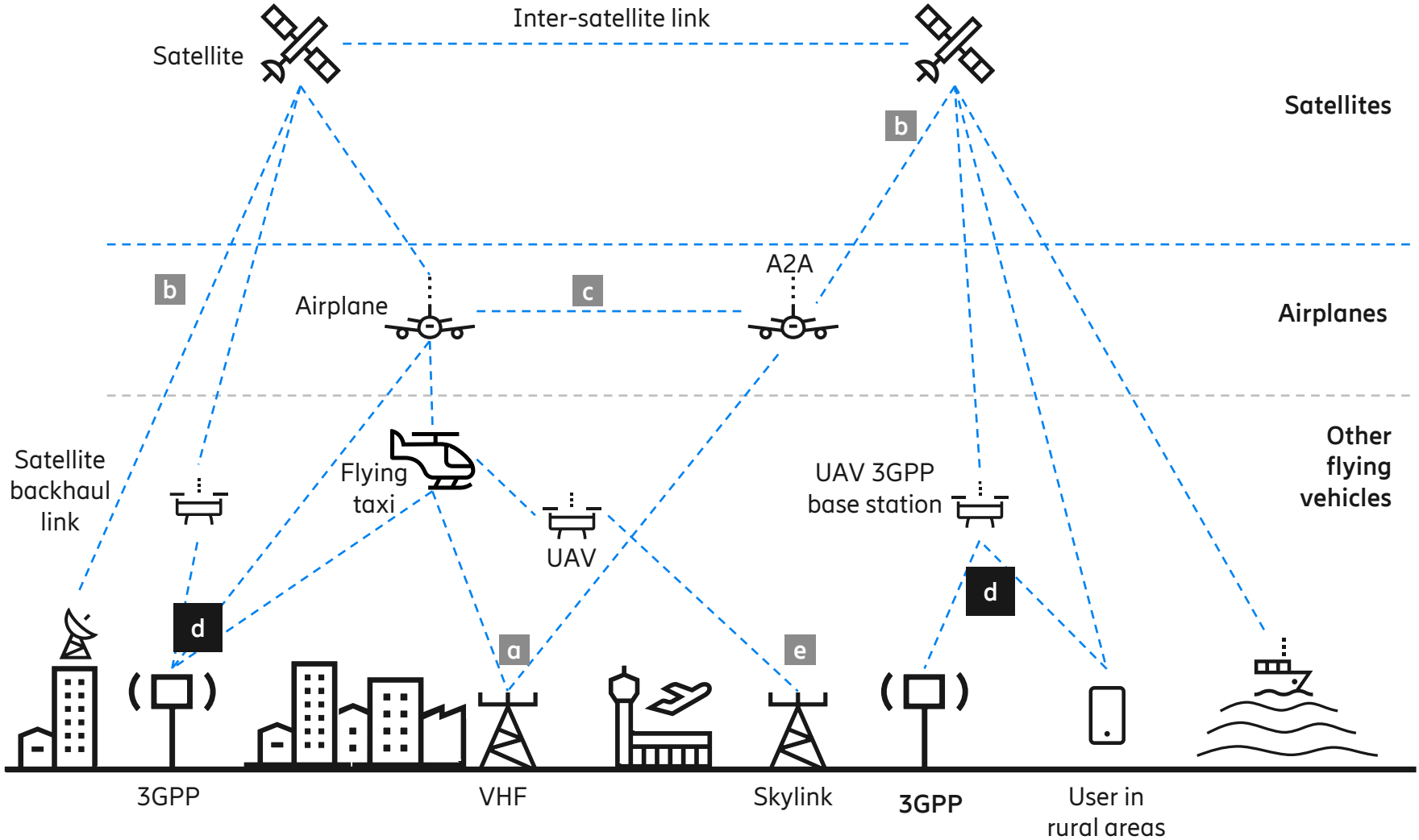
- 3D connectivity for UAV and aircrafts on any altitude
- 3D positioning
- Identification
- Quality of Service boost.

In summary Ericsson 3GPP systems provide flexible means for ensuring the safety and efficiency of aircraft operations in the DA market.

## Total Mission Critical Market

Public Safety, Rail, Utilities, Peacekeeping and Defense and Digital Airspace

# Communication technologies in Digital airspace



## Conventional technologies

- a** Aircraft Communications Addressing and Reporting System (ACARS), VHF 108-137 MHz
- b** Satellite communication SATCOM (data and voice)
- c** Automatic Dependent Surveillance – Broadcast ADS-B (978 MHz or 1090 MHz in US)

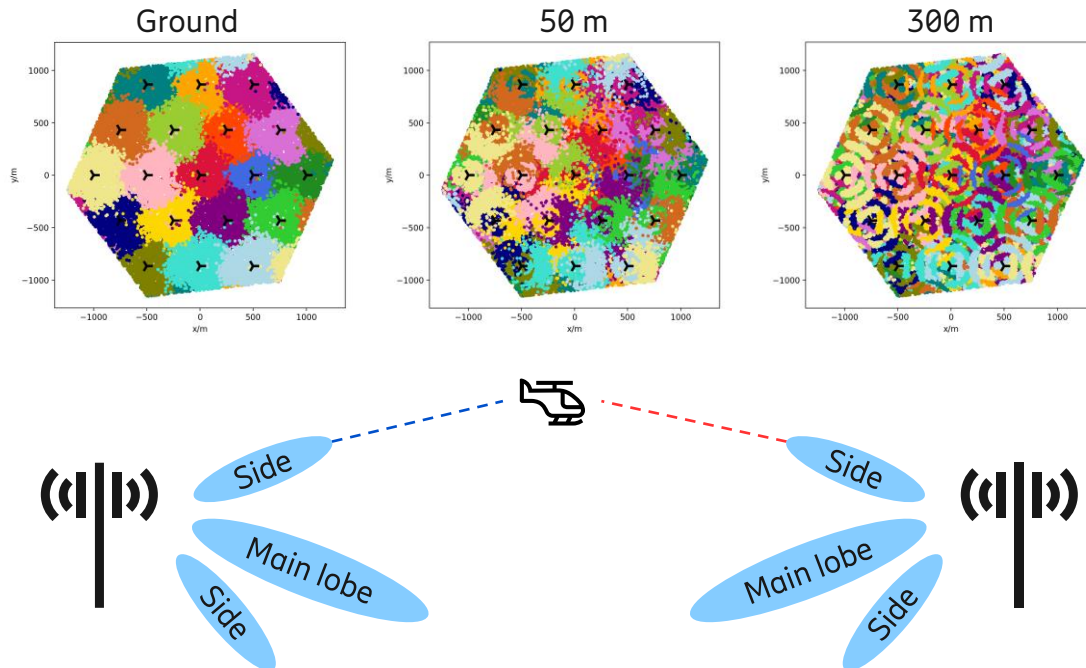
## Emerging technologies

- d** 4G/5G/6G (3GPP) communication for digital airspace
- e** Proprietary technologies, e.g. 5030-5091 MHz

# 3GPP coverage into the air from 2D to 3D



## Example: Cell association patterns at different altitudes (Ericsson Research)



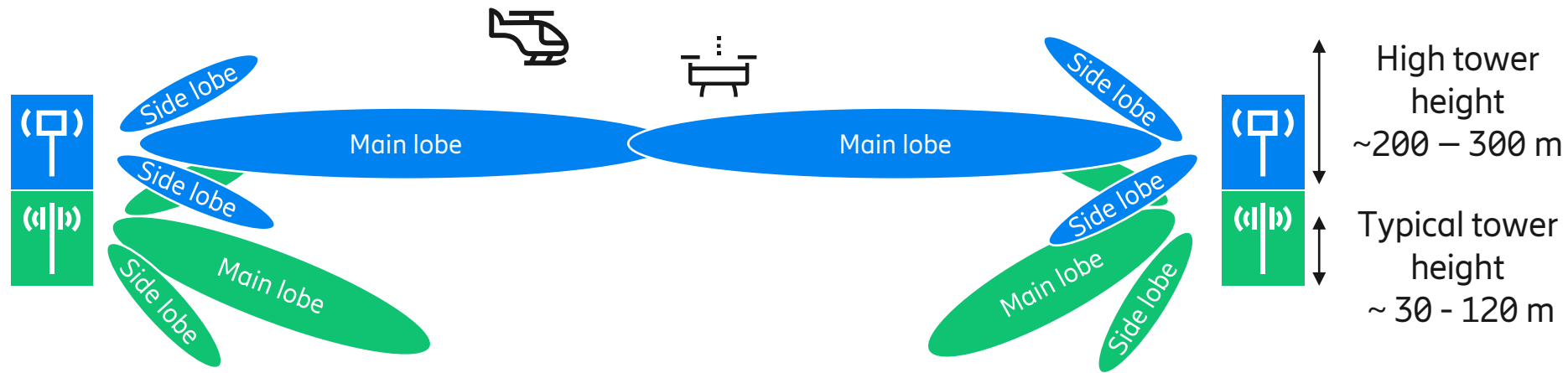
## Observations from research and experiment

### Air coverage status of existing eMBB networks

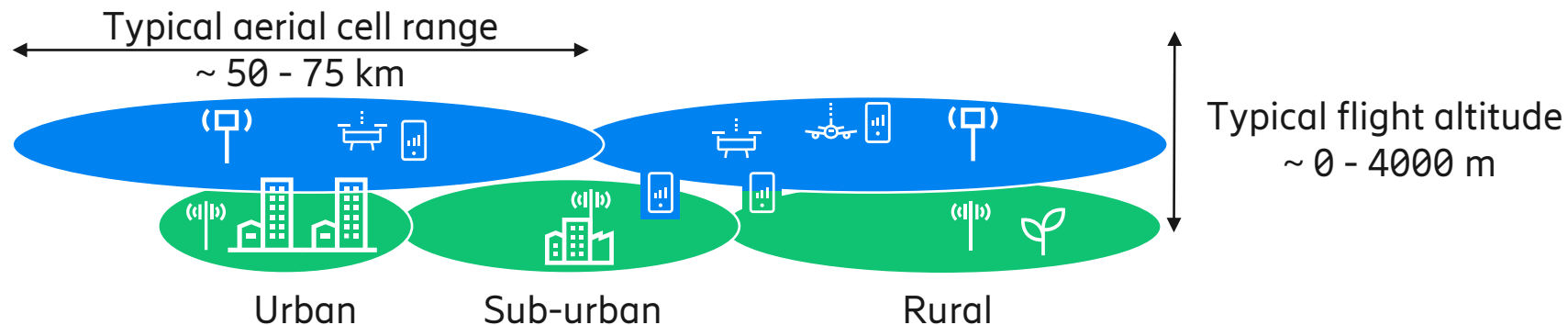
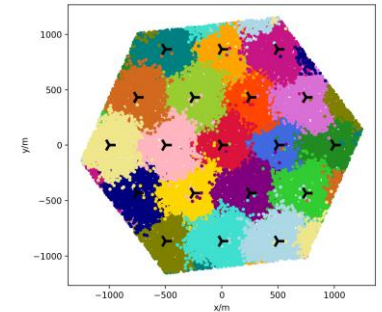
- Longer range signal propagation at high altitude, e.g., tens of neighboring cells can be detected
- Many handover scenarios – more cell-edge like radio conditions
- More interference – higher RSRP than ground UEs
- Weaker signal quality – lower RSRQ than ground UEs

Optimize RAN and network design to fulfill desired coverage and performance in the sky

# Separate networks serving ground and aerial devices



Example height: 200 m



Achieving air optimized connectivity in high altitude



A

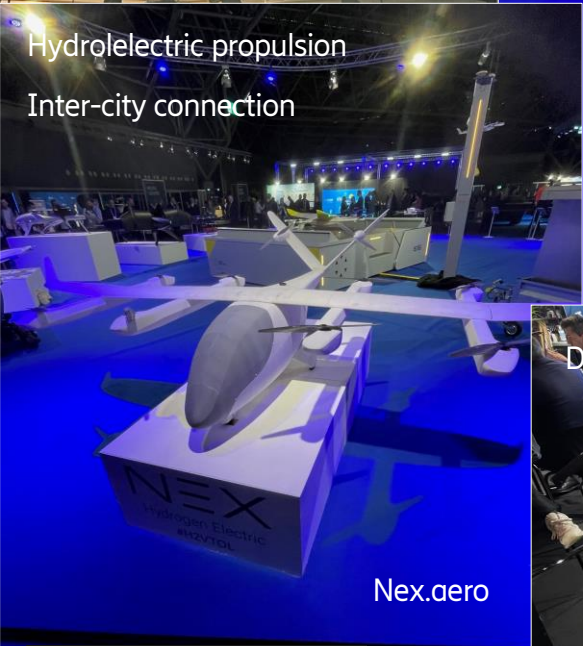
# Low altitudes (< 300 m)



Large volume deliveries  
Google wing



Drone-in-a-box  
SkyHive



Hydroelectric propulsion  
Inter-city connection

Nex.aero



Dangerous Goods Transportation

Techno sky



Aircraft de-icing

DJI



UAV able to lift 100 kg

Flyingbasket

DroneConnectSIM

kpn

## KPN Drone Connect

Enabling safe and efficient drone operations in the Netherlands

- ✓ 4G and 5G Connectivity
- ✓ Network Coverage Checker
- ✓ Application Priority

KPN Netherlands

Instant Drone Delivery

kyte

Instant drone delivery

Kyte

Amsterdam drone week impressions

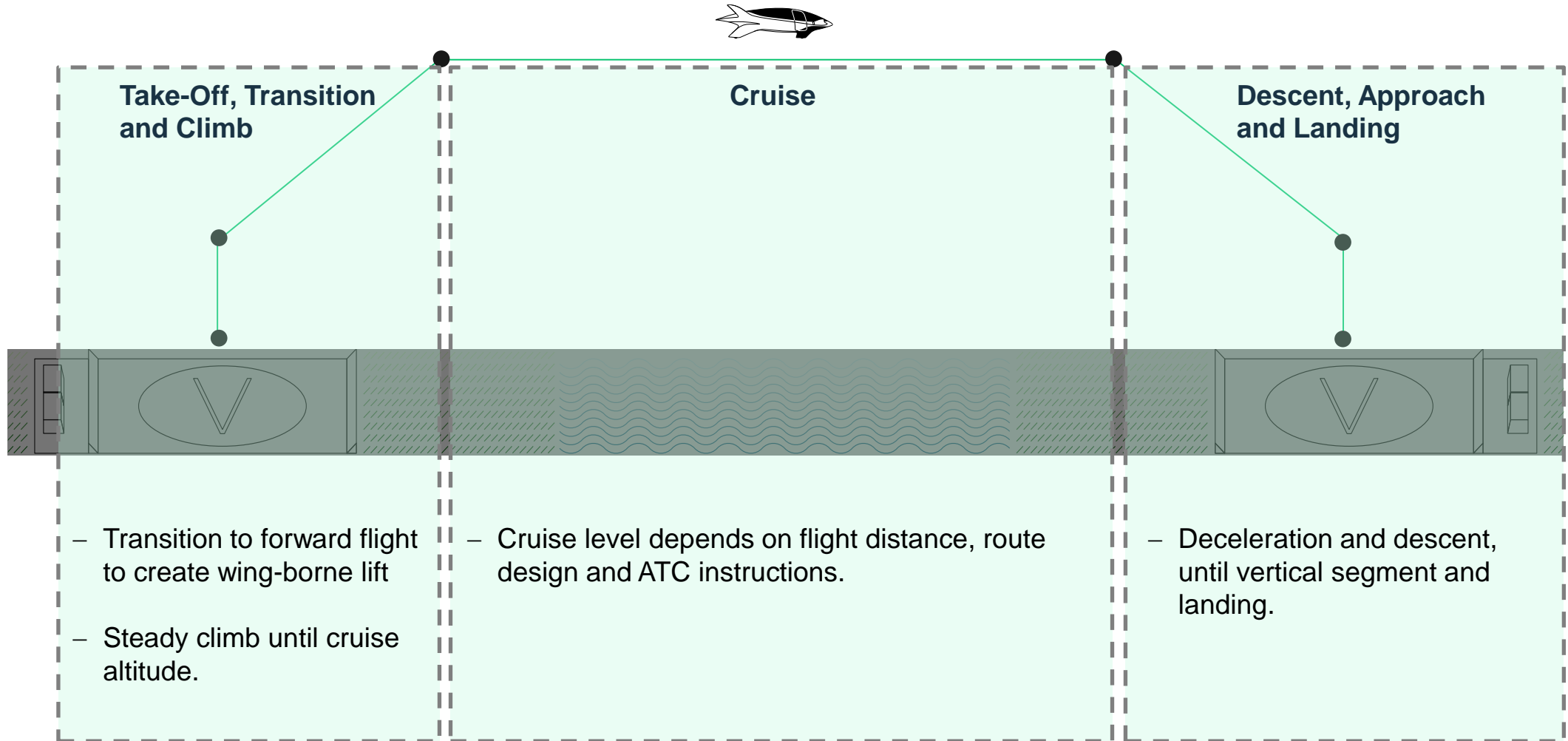


**B** Mid range altitude (300-3000 m)



Revolutionizing sustainable,  
high-speed regional air mobility

# Phases of Operations – Flight





# Mobile system an open platform for innovation

## Airspace Network APIs

### Quality of Service

- Guaranteed bandwidth to provide a stable drone control signal and inspection video live stream



5G network reliable connectivity

### Drone identification

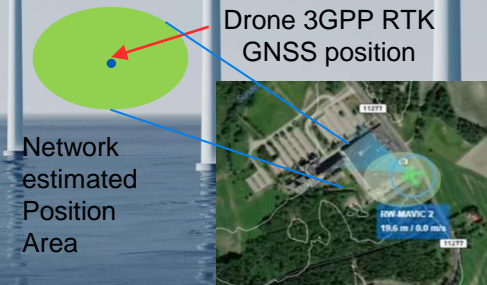
- SIM-based authentication with high level of security



UAV flight management

### Drone location tracking

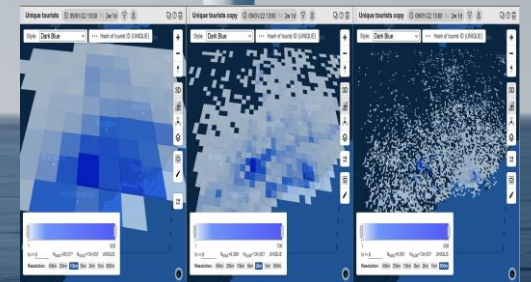
- Precise location based on 3GPP RTK GNSS - 5G
- 5G network 3D location (secured without spoofing risk)



UAV flight security through 5G

### Geographic SIM density

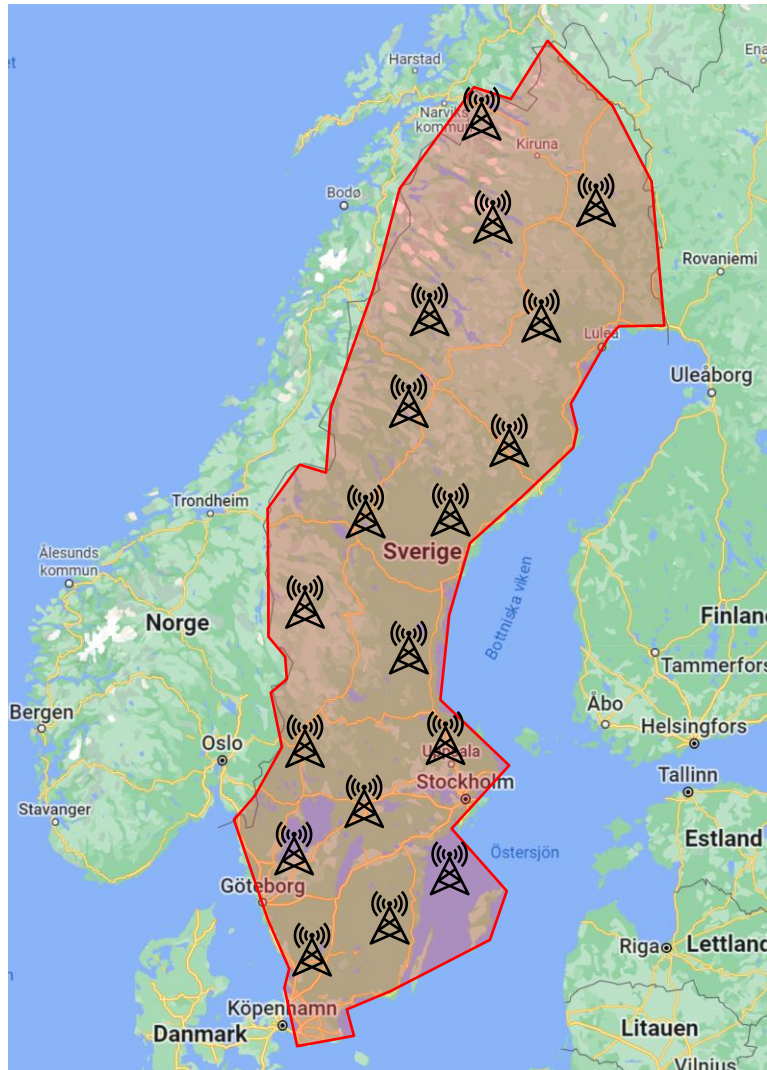
- Provide a dynamic real-time ground population density for pre-flight assessment and risk mitigation



# Airspace network rollout

## Nationwide coverage (0 to 6000 meters altitude)

EXAMPLE  
Potential Airspace network  
rollout in Sweden



### Medium Altitude AIRSPACE, Phase 1

Target initial coverage (major % of Land Area), very limited capacity (0 – 6000 m altitude)

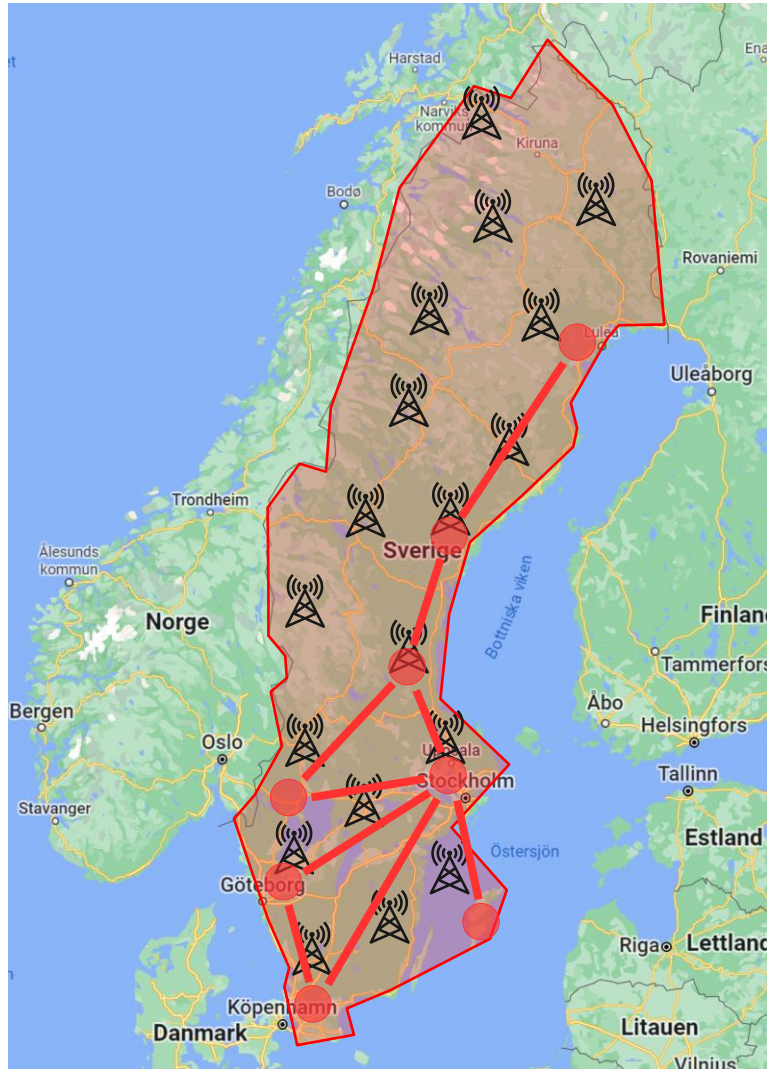
### Medium Altitude AIRSPACE, Phase 2,

Enhance initial coverage (major % of Land Area), limited capacity (0 – 6000+ m altitude)

# Airspace network rollout

## Low altitude coverage in inter-city air corridors

EXAMPLE  
Potential Airspace network rollout in Sweden



### Medium Altitude AIRSPACE, Phase 1

Target initial coverage (major % of Land Area), very limited capacity (0 – 6000 m altitude)

### Medium Altitude AIRSPACE, Phase 2,

Enhance initial coverage (major % of Land Area), limited capacity (0 – 6000 m altitude)

### Inter-city air corridors, **Low Altitude AIRSPACE (up to 200 m)**

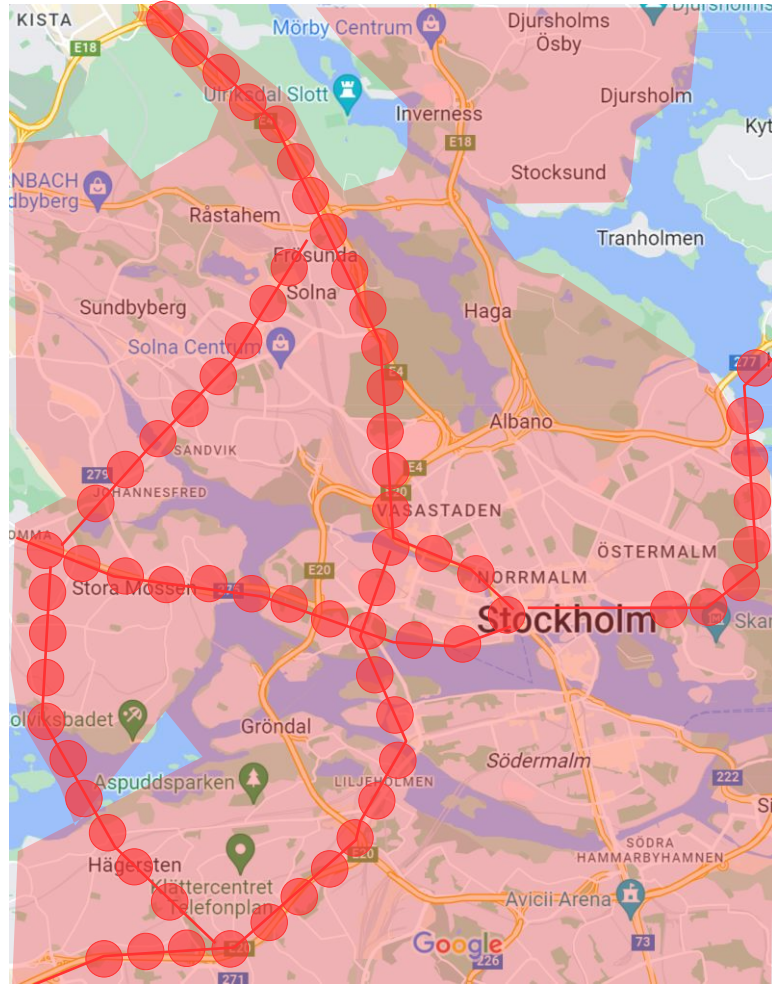
Capacity focus on connected air corridors



# Airspace network rollout

## Low altitude coverage in city air corridors

EXAMPLE  
Potential Airspace network rollout in Sweden



City air-corridors, **Low Altitude AIRSPACE (up to 200 m), Phase 1** increased capacity focus on **connected air corridors** in densely populated areas (0-200 m altitude)

Full city coverage, **Low Altitude AIRSPACE (up to 200 m), Phase 2** further increased capacity focus on densely populated areas. 5G only impacting cell size (0-200 m altitude)

# Q&A



