"U-space Finland" empowered by VTT
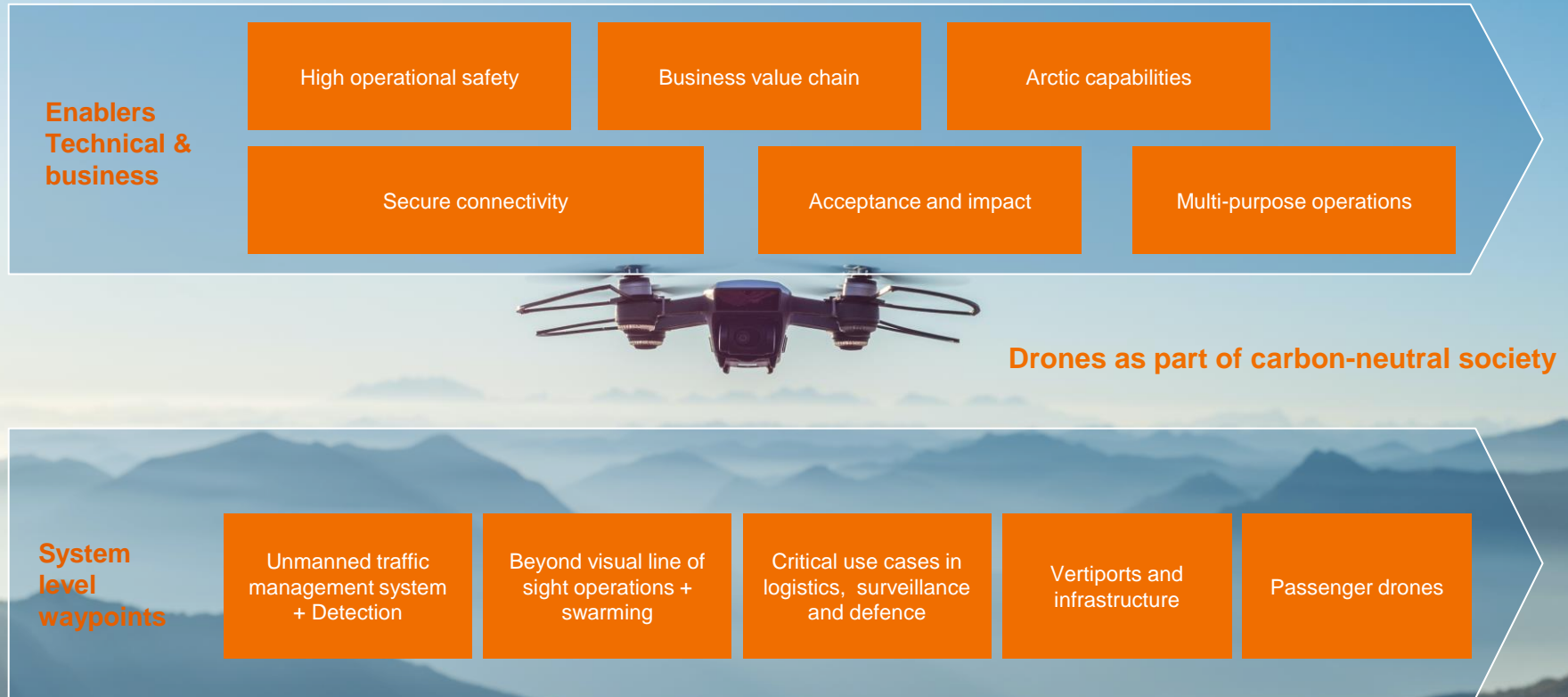
Business approach "why to fly" complementing technical "how to fly"

Shared Benefit –projektin esittely. Kiinnostus osallistumisesta:
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VTT

Research Roadmap for Innovative Air Mobility

VTT

Enablers Technical & business

High operational safety

Business value chain

Arctic capabilities

Secure connectivity

Acceptance and impact

Multi-purpose operations

Drones as part of carbon-neutral society

System level waypoints

Unmanned traffic management system + Detection

Beyond visual line of sight operations + swarming

Critical use cases in logistics, surveillance and defence

Vertiports and infrastructure

Passenger drones

2023

2024

2025

2026

2027

# Key takeaways from AiRMOUR Horizon 2020 project
www.airmour.eu

- Implementing drones and people carrying autonomous aircrafts in the context of medical and emergency services (3 years, 13 partners, 6M€, coordinator VTT)

- Validation flights in Kassel, Stavanger and Helsinki

- Production of e.g. "Urban Air Mobility (UAM) Guidebook for EMS, cities and operators" and "UAM Training programme and masterclasses"

- Business models, viable use cases, benefit analyses, etc.

- Final event and Masterclass in Luxembourg in November

Key takeaways from Business Finland financed DROLO co-innovation project www.drolo.fi

- Has profoundly paved the way for "Business from urban airspace" in Finland (3 years, 11 partners, 7.5M€, coordinator VTT)
- Ample contributions to the SoA for some of the key research questions such as urban airspace traffic management, risk management and secure low latency connectivity to UAV
- Demanding BVLOS operations carried out in Helsinki and Oulu – now preparing for the next generation of more capable devices (SAIL III->)
- The quest will continue in the next innovation stages
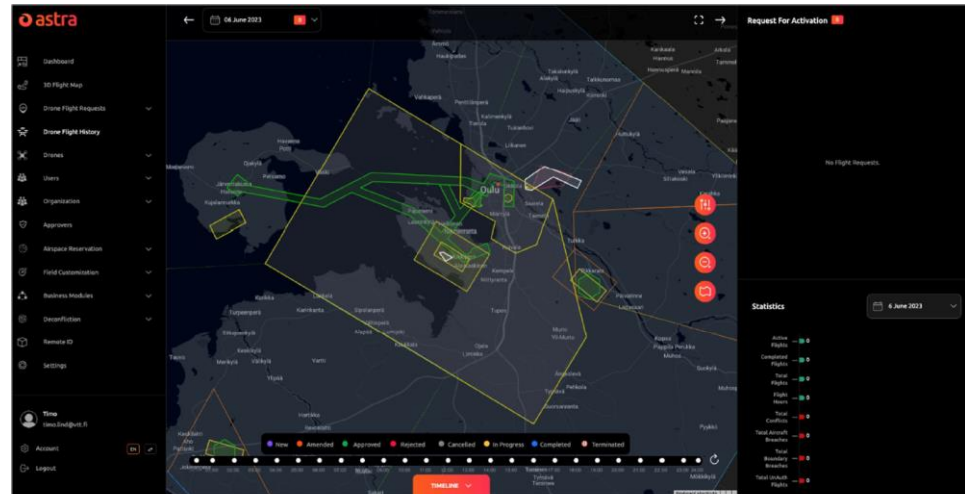
Picture 2: Astra U-space tool operator view. Oulu airport (EFOU) ATC controlled airspace seen here as the largest yellow rectangle.

Examples of technical R&D topics

VTT

Hydrogen fuel cells implementation

Multi-purpose B2B/B2C/C2C payload capability optimization

Human-machine interface in remote cockpit

Connect/communicate/command/control development

Satellite connectivity & cyber security encryption

Innovative Air Mobility Technical Enablers

Icing wind tunnel testing for propulsion and sensors

Drone containers for automated payload handling

CTR & U-space integration

Shared vertiport & charging testbeds

Air/ground risk estimation and mitigation, SAIL III+ operation

VTT's MIMO radar as landing radar

Autonomous systems software verification

Traffic & radio performance based smart flight path optimization

Business models, airspace integration, safety and acceptability are main barriers for business expansion
(Orbit AAM risk report 2023)

Technology

Top technological risks

2025
1	Battery technology shortcomings
2	Underdeveloped digital infrastructure
3	Insufficient security & connectivity technologies

2033
1	Underdeveloped digital infrastructure
2	Battery technology shortcomings
3	Underdeveloped physical infrastructure

Economy

Top economic risks

2025
1	Unsustainable business models
2	Limited capital and investments
3	Shortage of skilled workforce

2033
1	Fierce competition
2	Unsustainable business models
3	Shortage of skilled workforce

Regulation

Top regulatory risks

2025
1	Airspace integration challenges
2	Regulatory delays
3	Certification & airworthiness standard concerns

2033
1	Airspace integration challenges
2	Certification & airworthiness standard concerns
3	Regulatory delays

Society

Top societal risks

2025
1	Safety concerns
2	Social desirability
3	Equity & accessibility concerns

2033
1	Safety concerns
2	Social desirability
3	Equity & accessibility concerns

Politics

Top political risks

2025
1	Lack of government leadership
2	Inadequate public-private partnerships
3	Insufficient international cooperation

2033
1	Policy instability
2	National security concerns
3	Insufficient international cooperation

Environment

Top environmental risks

2025
1	Noise pollution concerns
2	Visual pollution concerns
3	Climate vulnerability

2033
1	Noise pollution concerns
2	Visual pollution concerns
3	Climate vulnerability

VTT

Future value network and focus topics for U-space Finland project

VTT

1. Users — B2B, B2C, C2C. Private and public sectors. Civil-authority dual use.

-> Consolidate demand

2. Service providers — Logistics service providers and various aerial operation service providers.

3. Fleet operators — Providing an aerial platform. Integrating tech and services to customers.

-> Identify and engage capable candidates

4. Solution providers — Enablers to the operators

a) Drone hw/sw (in the air)	**b) Drone operation solutions (on ground)**	**c) Sensors, data, ICT, cybersecurity**	**d) Enabling solutions**
The actual flying vehicle and its hardware and software components, physical actuators etc	Fleet management, smart mobility tasking platforms, remote operation solutions, landing pads, charging. Human resources for piloting, remote piloting and support tasks	Capturing data from the physical environment. Data transfer and storage for both command & control and payload data delivery	U-space Service Provider(s) Common Information Service Provider(s) What else is required for scalable operator business?

-> Evaluate socio-techno-economically

-> Identify missing elements for scalable operations

5. Cities as enablers — Spatial planning, permissions, infrastructure, …

6. Supporting functions — Regulation, permissions, insurance, …

-> Support towards active and enabling role

Examples of commercial R&D topics

VTT

ConOps impact on staff requirements, remote operation

Multi-purpose B2B/B2C/C2C business model optimization

Public acceptance actions

Service contracts and SLA's

Shared charging & other infrastructure sequencing and biz model

Innovative Air Mobility Commercial Enablers

Operating margin, revenue & OPEX sensitivities

Multimodal tasking/service brokering platform & business model

Availability, weather& other backups

Civil/authority dual use

Käynnistettävän hankkeen tavoitteet

("Kalliille järjestelmälle pajon käyttöä", Insta, Tampereen moniasiakasdronetapahtuma 23.10)

1. **Kohti operaattoriliiketoimintaan**. Paljon käyttökohteita. Samalla lennolla monta tehtävää. Paketin kuljetus, matkalla kuvantamista, paluumatkalla kuluttajakeikka tai teollisuushälytyskohteen tarkastaminen. Mahdollisimman vähän droneja, mahdollisimman suuri käyttöaste jokaisella.

2. **Monitoimidronen määrittely** = huoltomies jolla perustyökalut mukana (hinta, paino, energiankulutus)

3. **Mielenkiintoisia tehtäviä** tulevaisuuden työntekijöille. Etäoperointi ja tukipalvelut.

4. **Miten raha liikkuu**. Tulot pitkistä palvelusopimuksista. Alaspäin skaalautuvat henkilöstökulut, tekninen operointi, vakuutukset.

5. **Kuka operaattoriksi**. Kyky investoida jaettavaan kalustoon ja sen myymiseen.

VTT

"U-space Finland" high level plan, draft schedule stakeholders who have showed commitment/interest

VTT

Scope defined based on participant feedback (template)

Cities: Tampere, Oulu, Seinäjoki, Helsinki, Rovaniemi, Espoo and public sector behind them

End user orgs: Sote (Fimlab), last mile logistics (Jetpak, Posti/Transval), cities' own operations (Stara, safety, spatial planning), safety & security (Securitas), inspections (Jotus, Aeromon) …

Operator potential from different backgrounds (Tuomi, Telia, Coor, Cramo, …)

Technology & service provider companies (Telia, Insta, Anarky Labs, Flyk, Lentola, Varjo, Lähitapiola, other drone tech, …)

August   September   October

Phase 1 - Shared Benefit project

Participatory planning by 15-20 stakeholders, co-design workshops, led by VTT, funded by participants and VTT. In-kind contribution by Robots Expert and Fintraffic ANS.

In practice / benefits:
- Actively join 3-4 workshops
- Bring in your ideas/priorities & get ideas from others
- Build the future market together to adapt your business in it
- Participation fee (funding VTT work) 5k€ or 10k€, VTT standard SB project contract signed by all participants

Outputs / deliverables:
- Shared vision and high level roadmap
- Justification & feasibility of the operator business model
- Business concept evolution for all stakeholders from operators and U-space service providers to city planning
- Socio-techno-economical analysis
- External communication and influencing on the concept during the project
- "U-space Finland" funding and deployment plan

Jan to May 2024 tbc

Phase 2

"U-space Finland" operational deployment based on Phase 1 outputs

VTT available for temporary operational roles

2H/2024 onwards

VTT

Innovative Air Mobility in innovative cities as profitable growth business integrated into work and life in 203X

WHAT IF…

Drones (or "lennykät") operate **seamlessly and safely**, autonomously, with low or no noise & disturbance, based on novel zero carbon propulsion technology. As part of the broader **Smart Mobility concept** combining land, air, sea and rail transport and environmental monitoring. **Widely accepted and desired** part of city and surrounding economic infrastructure.

Generating **economic growth and attractiveness of the city**. Novel services, productivity and customer satisfaction for various companies either as users or as part of service delivery value chain from fleet operation to technology solutions. Enabling **new jobs & exciting careers** in the aviation and logistics industry for the next generation, **international growth** for companies developing service concepts and technology.

Drone fleet operator services are based on **shared multi-purpose infrastructure in air and on the ground**, based on high level of automation and remote operation. Delivering B2B, B2C and C2C services, based on long term service level agreements complemented with transaction based business.

B2B example: Instead of driving back and forth to a depot to collect missing tools or spares, a maintenance engineer working on a hydro dam in a river north of Rovaniemi - gets **autonomous delivery** on site by an industrial drone developed by a globally leading Finnish manufacturer. Along the route, the drone also delivers realtime video and other data to update the area's digital twin.

B2C example: Running out of food and bubbly in the middle of a romantic picnic date. Order from an app, **nearest available drone** delivers in a matter of minutes, landing controlled with Tiina's XR headset. The app, created by a Finnish startup company, works globally from Hyde Park to Oulunsalo.

Exciting and productive future industrial work example: Carmen is a **remote pilot**, common profession in Finland, moved to a lakeside cottage near Tampere with her family from Spain, using novel industrial metaverse and AI assistance technologies for flight control and situational awareness on drone fleets around the world.