

ELIS

THE FUTURE OF
ELECTRIC AVIATION



Development program and testbed for electric aviation - project “Test track for eVTOL”

www.elisprogram.com



**Skellefteå
municipality**



SKELLEFTEÅ
SCIENCE CITY

Need to handle complexity in the air...



...and on the ground



Why a development programme and testbed for electric aviation in Skellefteå?



- Cold climate and harsh weather conditions
- Empty airspace
- Green and affordable electricity and 1MW power supply at the airport dedicated to electric aviation
- Competence within electrification, batteries and hydrogen
- Strong local support and local demand regarding fast and sustainable transport solutions

Status at the moment



- 1 MW power supply ready to use
- Green Flight Academy operate three electric aircraft at the airport
- Test track for eVTOL/drones
- Local drone logistics project
- Project regarding weather proofing vertiports
- Research in electromagnetic interference with LTU
- Discussions with manufacturers
- Development of a test bed

Test track for eVTOL



SKELLEFTEÅ
AIRPORT

13 KM

NORTHVOLT ETT





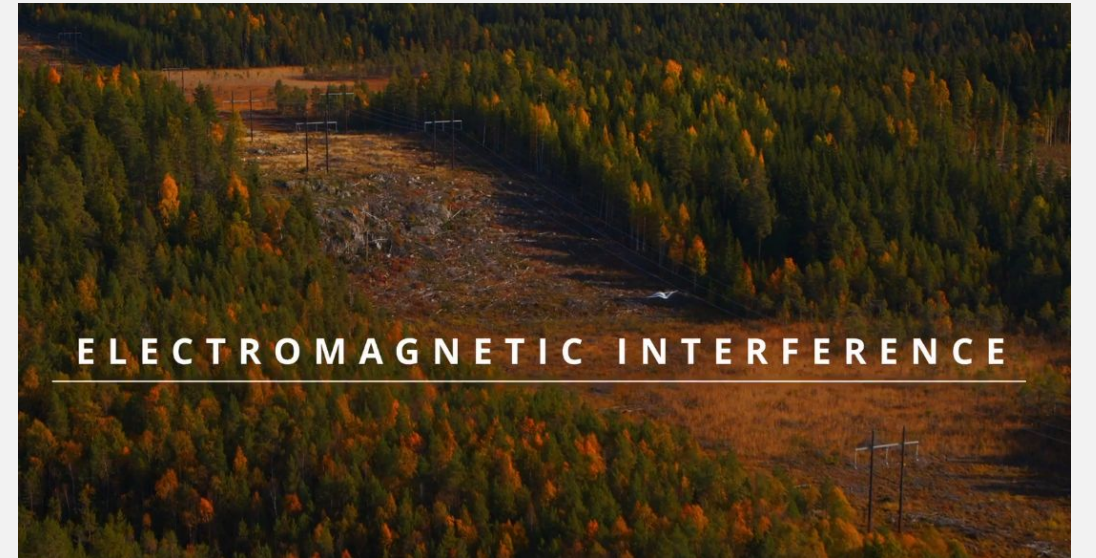
GROUND INFRASTRUCTURE



AIRSPACE AND PERMISSIONS



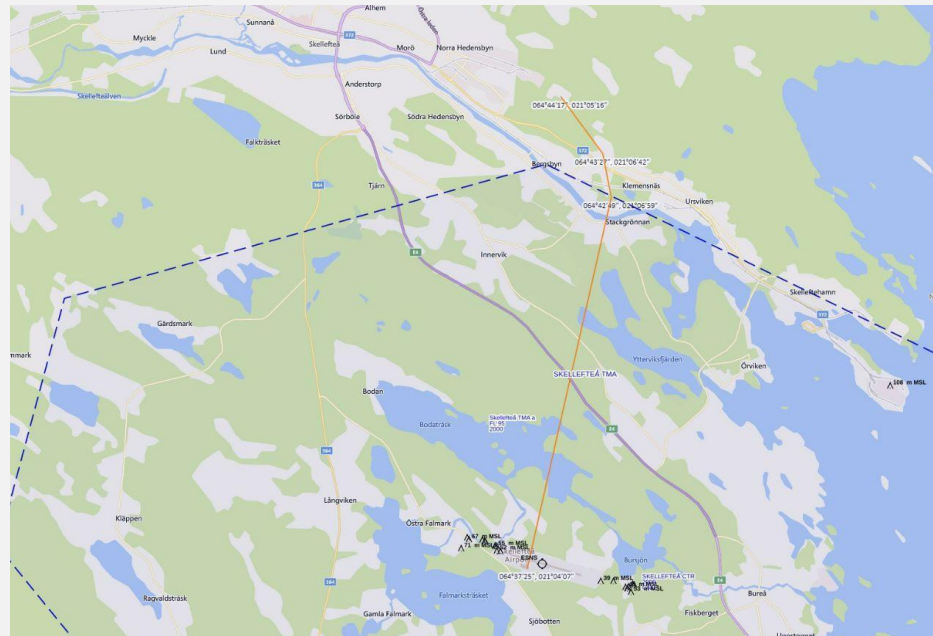
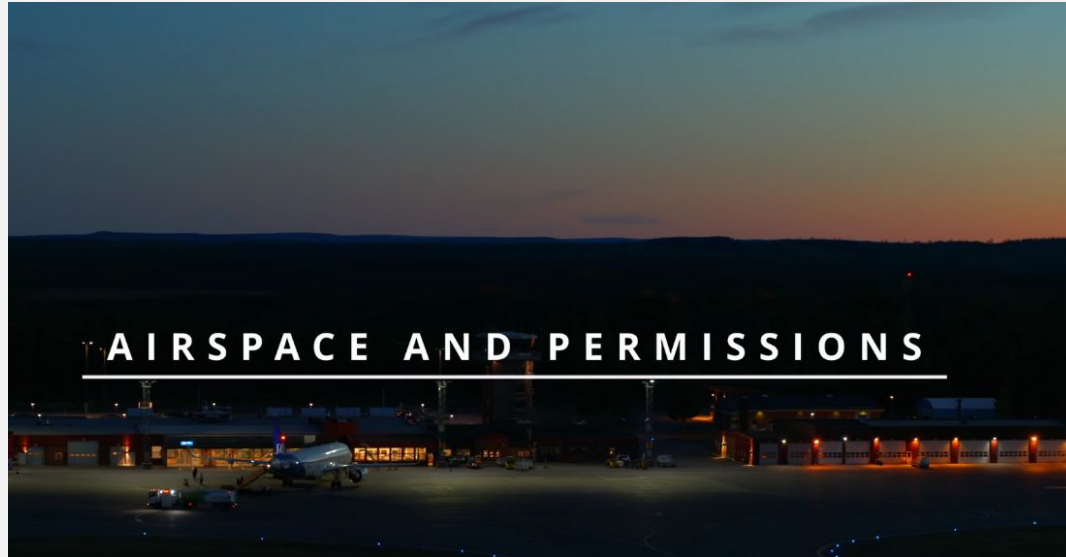
BUSINESS MODELS
AND BUSINESS CASE



ELECTROMAGNETIC INTERFERENCE



- EASA guidelines
- Large differences depending on location of vertiports
- The power supply is manageable
- Passenger process is uncertain
- Weather proofing will be important
- Safety and security are crucial
- Hangars and facilities
- Distributed MRO



- Remember that safety is key - Emergency Response Plan etc.
- Large differences between piloted and autonomous operations
- 4G/5G, LIDAR, sensors, cameras, GPS etc. are all crucial but add complexity
- Control Zone vs Restriction Area
- Tests can be handled but a lot of manual processes involved
- Permissions on a use case basis
- Verified the test track from a number of parameters



- A lot of uncertainties
- More expensive than expected
- Scheduled, on-demand, subscriptions etc.
- Will need many different customers - transfer, tourism, commute, public transport, healthcare, freight etc.
- Public acceptance is still uncertain
- U-Space and autonomous flights still far away
- Perhaps easier to integrate in the first step in more sparsely populated areas
- Energy efficient and time efficient in some cases



eVTOL base in Skellefteå

- 2 eVTOL (4 passengers and 2,5 MEUR/eVTOL)
- 3 pilots/eVTOL
- 2 MRO staff
- 1 main base at Skellefteå Airport
- 2 vertiports
- 3-5 vertistops
- 22 flights/day per eVTOL
- 70% load factor
- 300 days per year with revenue flights
- 123 passengers per day

Revenues and costs per year: 2,4 MEUR

Costs

- eVTOL (Capex, Leasing, Insurance)
- Ground infrastructure (vertiports, hangars and chargers)
- Energy consumption
- Batteries and Maintenance
- Crew, MRO and handling staff (salary and education)
- Operations, safety and security, emergency response etc.
- Administration, marketing, IT etc.

Lessons from our test flights in September 2022



Some conclusions

- No precise regulations regarding ground infrastructure yet.
- Still several question marks around noise, safety and acceptance.
- The airspace issues can be handled if the eVTOL is flown by a pilot.
- EMI and EMC pose a challenge and are areas that could delay any form of electrified aviation - the project has identified significant research needs.
- Several question marks about robustness in cold and harsh weather conditions.
- Testing and developing the ecosystem in real-world conditions will be important.
- There are no uniform or standardized permit processes for test flights.
- It can be an energy efficient and time competitive mode of transport for both people and goods.
- Initial traffic will be expensive - might limit the potential.
- Training of pilots and other skills in the ecosystem will be critical.
- Collaboration will be a key factor for commercial implementation.

**Maybe the world's most
beautiful 1 MW charging
station for electric aircraft
and eVTOL...**



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