THE STATUS AND POTENTIAL OF ELECTRIC AIRCRAFT FROM A FINNISH PERSPECTIVE

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The status

- Helsinki Electric Aviation association was founded in November 2017
  - To learn about electric flying and actually fly electric airplanes
  - Now we are also promoting electric flying in Finland
  - First plane Pipistrel alpha electro in spring 2018
    - Finland first (official) electric flight 31.7.2018
    - Now it is registered as a test aircraft
    - Will be registered as an ultralight aircraft when Ultralight aircraft weight increase will take effect in Finland early 2021
  - Ecological and Electric Aviation seminars in 2019 and 2020 , together with MAF Finland (Mission Aviation Fellowship) Next one is planned on 10.3.2021 in Helsinki
  - Electric aircraft battery development with Aalto University
    - Test battery should be done before end of the year
  - Analyses have been made regarding an electric sky diving and glider towing aircraft.
  - In next year plan is hybrid powerline

The status

- Electric aeroplanes in Finland:
  - 1 pipistrel alpha electro
  - 2 electric Mini-LAK sailplanes
  - 1 Two seat electric sailplane
  - 1 Fly nano prototype
    - A seaplane weighing under 75kg and not requiring any flying license
  - Project for electric 4-6 seat amphibian (looking for financing)
- Pyhtää airport (Helsinki east)
  - Future aviation and drone development & test centre
- Kvarken project
- Similar project is starting with Estonia
- At least one start up operator is considering small electric airplanes for future operations

The Status

- **Challenges of the electric flight network**
  - Malmi airport and city of Helsinki
    - For the network to function in Finland, a suitable airport in the Helsinki metropolitan area is required.
  - Fast trains
    - There is some kind of a “railway religion” in Finland. People are happy to invest billions in “fast” trains and trams, even if railways are very inflexible and most cases not even that fast.
  - Bad image of flying
    - General discussion about flight tax and the environmental impact of flying has had a negative effect on the image of flying. Flying itself is not bad form of transport, it is the current engines. In contrast, electric flying is probably the most ecological way of travelling.
  - Political interest
    - Politicians should see potential of electric flying and the advantages of being a forerunner in electric flying.

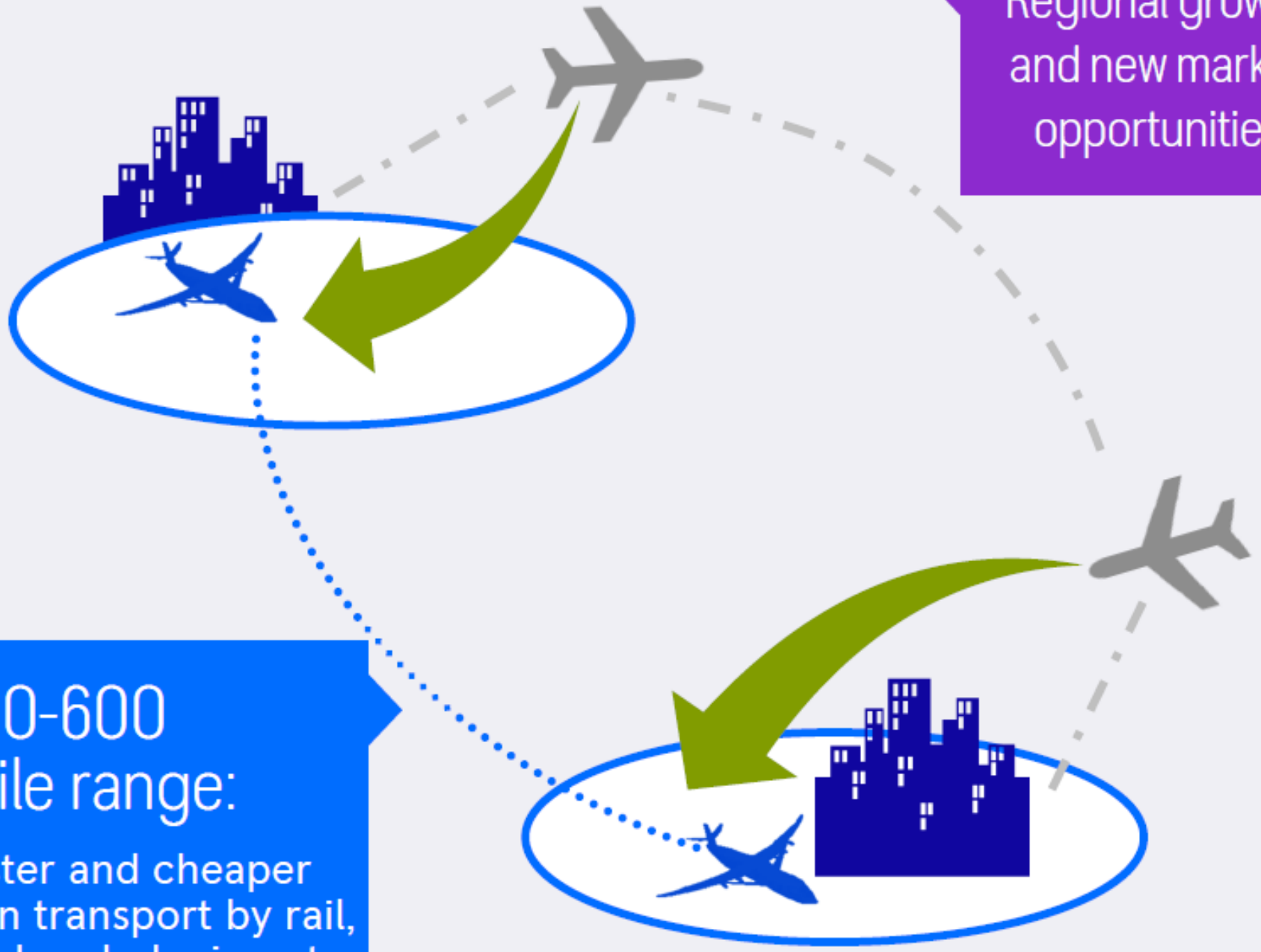
POTENTIAL OF ELECTRIC AIRCRAFT FROM A FINNISH PERSPECTIVE

- Domestic air services have been scaled down from what they used to be:
  - Finnair strategy is to fly large planes to Asia
  - No more commuter aircraft in use
- Large country with small number of people
  - Lots of lakes (180 000)
  - Large archipelago
- Finland's goal is to be carbon neutral by 2045
- Fast transportation between cities would be much cheaper to do by air
  - A fast 1h train from Turku and Tampere to Helsinki would cost several billion euros
  - A 30min electric air bridge some 50K€
- Finland is, in practice, an island: you arrive either by plane or by boat
  - Wouldn’t a cost-effective E-flight service between Finland and neighboring countries grow the economy?
- City airports are needed
  - Many cities have moved their principal airports from the city center to 20-30km away
  - Low-noise electric planes could operate near city centres from short runways (1 km or less)
  - Cost of building a 1km runway is minimal compared to the cost of railway infrastructure

Revolution in mass passenger transportation

Hybrid-Electric flight catalyses:

- Low-noise aircraft and short runways
- Transformational airport design and accessibility
- Diverted rail subsidies
- Increased passenger numbers



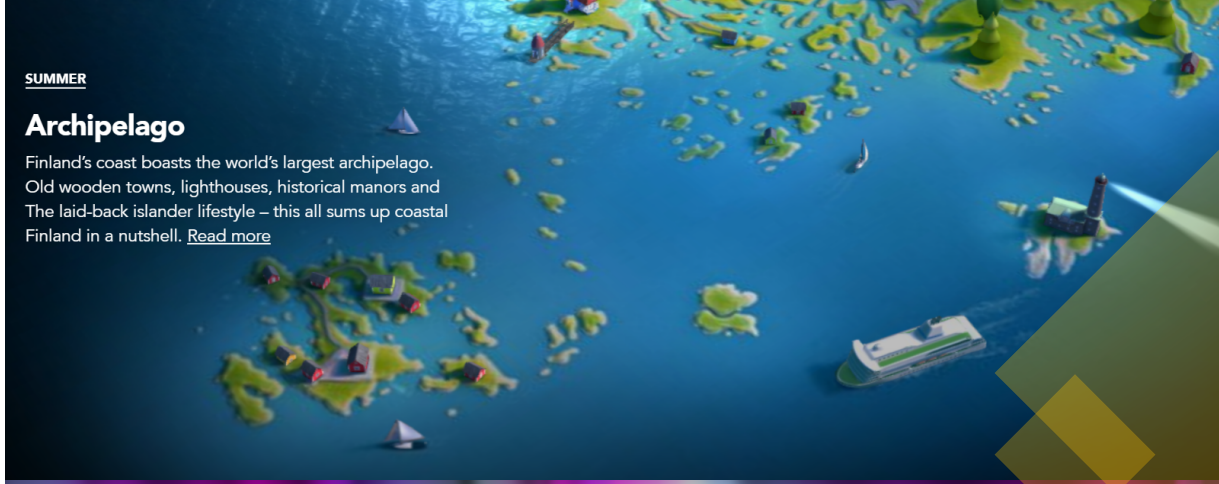
Regional growth and new market opportunities

100-600 mile range:

Faster and cheaper than transport by rail, road, or hub airports

POTENTIAL OF ELECTRIC AIRCRAFT FROM A FINNISH PERSPECTIVE

- In Canada, Harbour Air (the largest seaplane operator) is converting its entire fleet to electric:
  - Operating 12 routes between hubs like Seattle and Vancouver
  - If it works in Canada, why not here?
  - Basically, all cities and towns are near the sea, lake or large river
    - Maybe even travelling between nearby cities
    - Taxi flights to remote islands and tourist places



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