Gefördert durch
Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie

Projektträger

UmSiTrUL

Environmentally friendly and safe eVTOL transportation in urban airspace

Delivery drones in urban areas • medical transport • automated 3D geodata processing • noise modelling • safe, environmentally friendly and noise-optimized flight routes • electrically powered drones (eVTOLs) • emergency landing

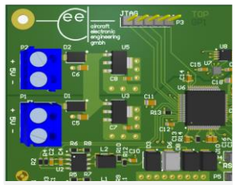
Client	„Holistische Air Mobility Initiative“ im Bayerischen Luftfahrtforschungsprogramm (HAMI)
Project management Contact and more info	PSU | Prof. Schaller UmweltConsult GmbH info@psu-schaller.de | psu-schaller.de
Project partner	TUM – Lehrstuhl für Luftfahrtsysteme Phoenix-Wings GmbH
Subcontractors PSU	GEOSYSTEMS GmbH aircraft electronic engineering GmbH SprintEins GmbH ili gis-services
Project period	2022-2024
Services of PSU	▪ GIS-Analysis and Workflows ▪ Noise Immission Calculations ▪ Generation of Emergency Landing Points ▪ Automated Calculation of Optimized Routes ▪ 3D-Visualization

The Project

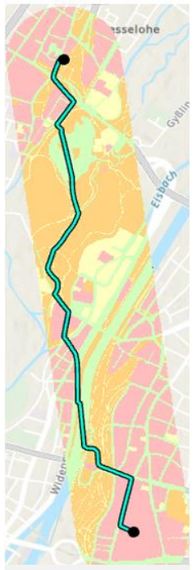
UmSiTrUL makes a contribution to the currently discussed requirements for safe, efficient and environmentally friendly drone transportation in urban airspace. In order to achieve public acceptance of the future operation of electric vertical take-off and landing aircraft, their operation must be environmentally friendly and safe for people. The northern area of the city of Munich served as the study area.

Flight with emergency landing points displayed

Safe Emergency Landing

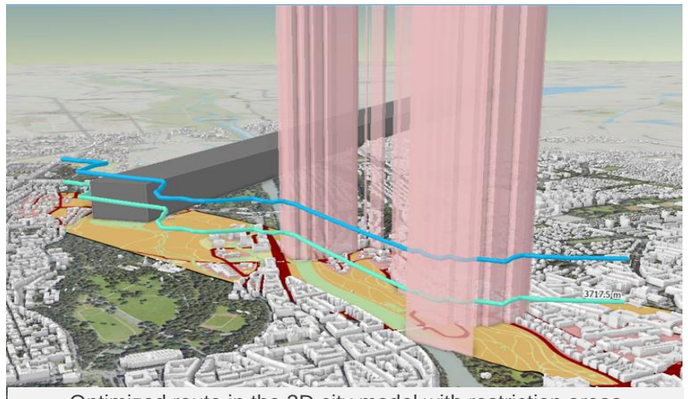

EMC Circuit Board

Potential emergency landing areas were identified using high-resolution geodata. Workflows were developed for this and ArcGIS Pro Tools were programmed for automated execution. The emergency landing points generated in this way are given to the drone for the emergency mission computer (EMC) during the flight. Should an emergency situation arise during the flight, the EMC calculates the nearest suitable emergency landing point and starts an autonomous emergency landing. This ensures that there is only a low risk of danger in the event of an emergency landing in densely populated urban areas.


Optimized Route

Flight Route Optimization

The creation of low-noise flight corridors in urban areas was based on geodata, which was reclassified into noise sensitivity classes. In addition, other environmental issues such as bird migration routes and protected areas were included in the route optimization as well as restricted zones of the geographical areas according to LuftVO §21h. Different weightings lead to several route suggestions, depending on the prioritization level of the flight. Route optimization is carried out by using the workflows developed for specific flight planning before the flight.

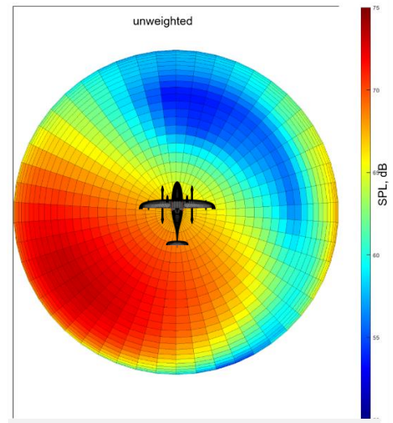

Optimized route in the 3D city model with restriction areas


Noise emissions from the drone on buildings that are flown over

Noise Measurements and Noise Immission Calculations

In order to find out how high the noise emissions from drones are, measurements were carried out using test flights. The measurement results were incorporated into noise modeling at TUM, resulting in a noise model with several parameters. A CFD model of the drone was used for this modeling and simulations were then carried out.

The results of this noise modeling were used in virtual flights in the 3D city model to calculate the noise immission on the buildings and the ground of the city districts flown over.



Noise hemisphere of the PW.Orca

Flight Tests

To verify the results, real flight tests were carried out to validate both the emergency landing and the results of the noise modeling.


PW.Orca on the airfield