TECHNISCHE UNIVERSITÄT DRESDEN

AirMetro
Research Training Group
2947 at TU Dresden

T3: Safe AAM Traffic

Safe design of landing sites for AAM aircraft

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Motivation

- Understanding and modeling the risk of an accident of highly automated AAM aircraft is crucial for the approval and societal acceptance of Advanced Air Mobility (AAM).
- Safety parameters, especially collision risks based on procedural design, are prerequisites for network/location planning for AAM aircraft and landing sites with different levels of automation.

Goal: Modeling of safe flight procedures to and from landing sites for AAM aircraft in urban environments. Derivation of recommendations for future certification standards of the European Union Aviation Safety Agency (EASA).

Figure 1: Integration of an AAM landing site in an urban environment: Dresden Postplatz (SmartFly, funded by Simul+, Photo: phase10 Ingenieur- und Planungsgesellschaft mbH)

Methods

- Development of a total energy flight performance model and flight trajectories for AAM aircraft with (hybrid) electric propulsion.
- Determination of navigation tolerances (AAM aircraft sensor/control), derivation of procedural protection zones through collision risk modeling, modeling of active onboard/ground-based safety systems.
- Agent-based Modeling and Simulation (ABMS) for calculating collision probabilities in manned aviation.
- Data-driven methods to predict the agent's behavior (AI).

Results

- Knowledge about collision risks for sizing procedural protection zones.
- Integration of UAS landing sites with appropriate protection zones in urban environments.
- Modeling of realistic flight paths for AAM traffic network planning.
- Experiments in the SML: Validation of flight performance models and navigation performance (T5, T8) also considering extreme environmental conditions

Networking in the RTG

The calculation of safe flight corridors:

- provides the basis for the safe operation of AAM,
- sets requirements on communication and navigation performance (Performance Based Navigation, PBN),
- allows determination of external benefits and costs related to landing sites (T1), and
- enables high precision in data collection, analysis, and processing (T4).

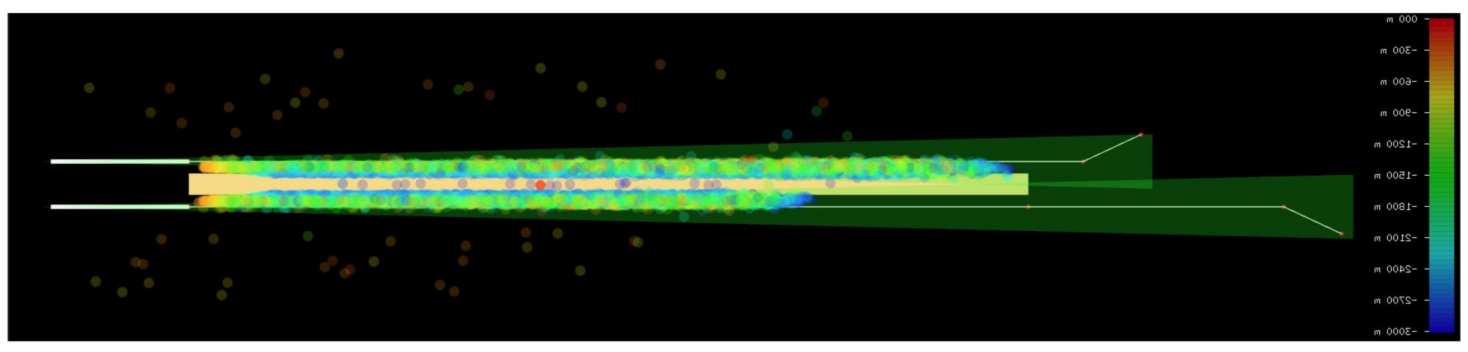

Figure 3: Collision risk on final for two runway operation [1]

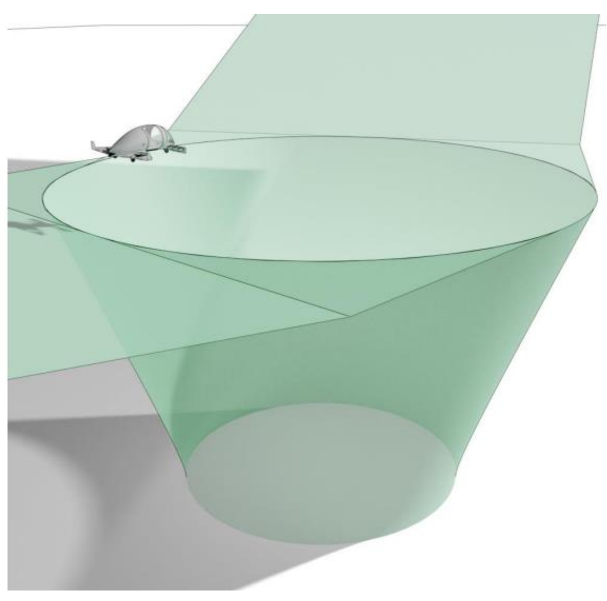

Figure 2: Design of approach and departure surfaces (EASA PTS-VPT-DSN)

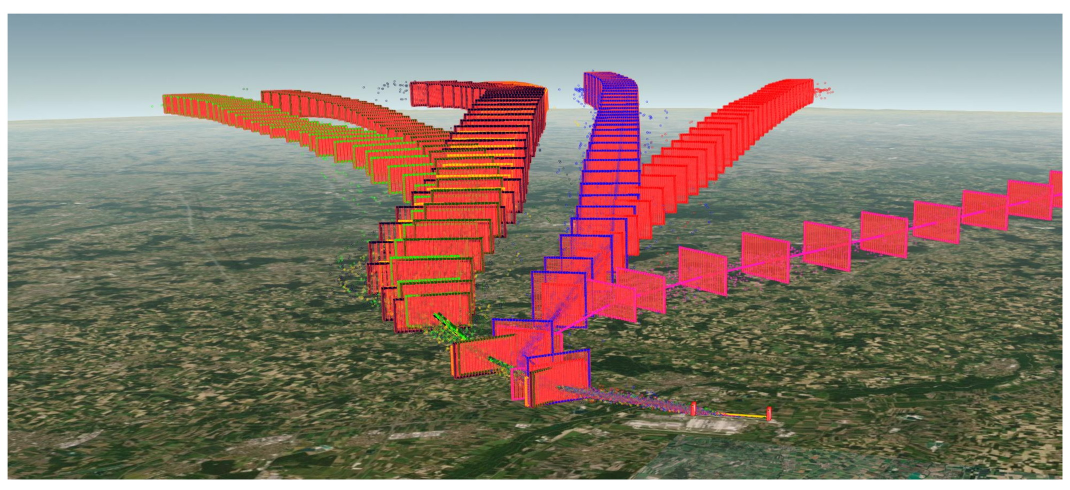

Figure 4: Departure corridors optimized based on flight performance from Munich Airport 26R [2], [3]

Literatur:

[1] *Fricke, H., Förster, S., Brühl, R., Austen, W., Thiel, C., "Mid-air collisions with drones Assessment of collision scenarios and of drone operation risks in urban areas," in 14th USA/Europe Air Traffic Management Research and Development Seminar (ATM2021), 2021*

[2] *Lindner, M., Zeh, T., Braßel, H., Rosenow, J., Fricke, H., "Traffic Flow Funnels Based on Aircraft Performance for Optimized Departure Procedures," Future Transp., Jg. 2, Nr. 3, S. 711–733, 2022. doi: 10.3390/futuretransp2030040*

[3] *Zeh, T., Lindner, M., Rosenow, J., Fricke, H., "Optimization of Departure Routes Be-yond Aircraft Noise Abatement," in International Conference on Research in Air Transportation (ICRAT 2022), 2022*

Network member in:

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