

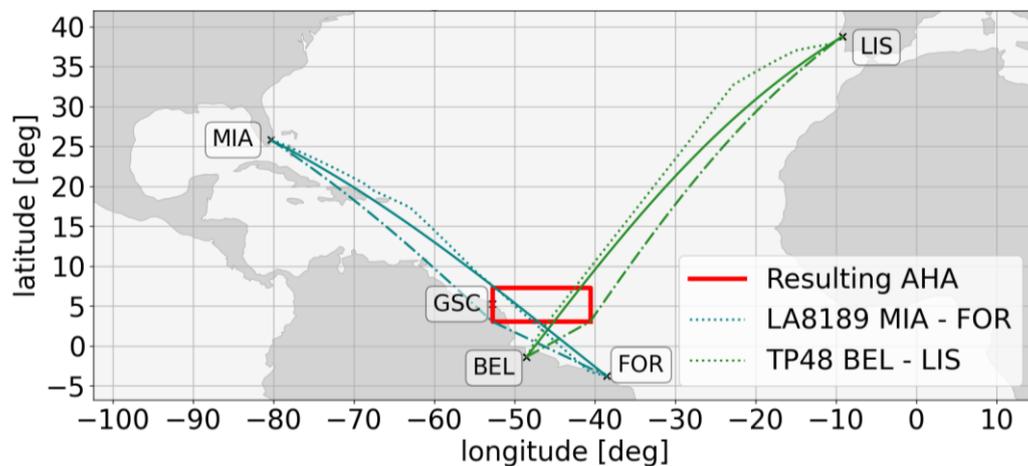


Student thesis announcement (BA/SA/MA)

In the field of Space Traffic – Air Traffic interactions and Ground Risk modelling (German/English)

Background

Space activities and aviation show many interactions. For example, navigating aircraft by using GPS has become standard. But on the other hand, rocket launches and satellite re-entries show a hazard for aircraft as objects from the spaceflight activity might collide with aerial vehicles. Therefore, the airspace around planned trajectories of spacecraft is closed for air traffic. These airspace closures can be implemented by standardized approaches considering the risk of aircraft being hit by spaceflight activity related objects. Based on the calculated risk, different types of airspace closures can be established, differing in activation conditions and durations. Static airspace closures are often called Aircraft Hazard Area (AHA) and backup closures Debris Response Area (DRA).



Simulated airspace closures (Aircraft Hazard Area (AHA)) during a launch scenario with original flight routes (dotted), great circle distance (line) and rerouted (dash-dotted) connections of two selected flights.

In general, these closures cause flight delays and cancelations, additional emissions, as well as costs for airlines. The increasing numbers of flights and space activities makes this issue crucial to achieve sustainability in the future. To analyze and model these closures and their impact on air traffic, several aspects need to be investigated. As another aspect of spaceflight activities, the risk on ground including vessels on the sea must be investigated

Open Air Traffic Topics:

- Implementing an updated delay cost model and analyzing the resulting costs in various AHA scenarios
- Implementing and assessing responsive aircraft rerouting strategies based on waypoint routing.
- Investigating Air Traffic Management approaches for DRA handling and assessing their effectiveness
- Implementing advanced aircraft vulnerability models and analyzing results

Space Traffic Topics:

- Analysis of debris propagation uncertainties for determining altitude dependent stochastically distributions
- Generating normal spacecraft trajectories by augmenting a nominal trajectory calculation tool
- Implementation of advanced ground risk models including ships and analysis of the results
- Analysis of environmental uncertainties in the very low earth orbit on re-entry trajectories
- Assessing casualty risk from huge satellites based on generated DRAMA models.



The exact scope and focus of your topic will be defined together based on your interests, knowledge and the timeframe.

What you shall bring:

- Capability of working in a reliable and self-motivated way
- Basic knowledge and interests in air traffic management or space flight activities
- Interests in working with simulation tools, or optional coding (advantageous)

Start of the thesis: Any time

If you are interested or have any questions, please contact (transcript of records + CV in application advantageous):

Antonio Depardon, M.Sc., E-Mail: antonio.depardon@tu-braunschweig.de, Tel.: +49 531 391 9980
Institut of Space Systems, Hermann-Blenk-Straße 23, 38108 Braunschweig