Technische Universität Braunschweig

Institut für Flugführung IFF

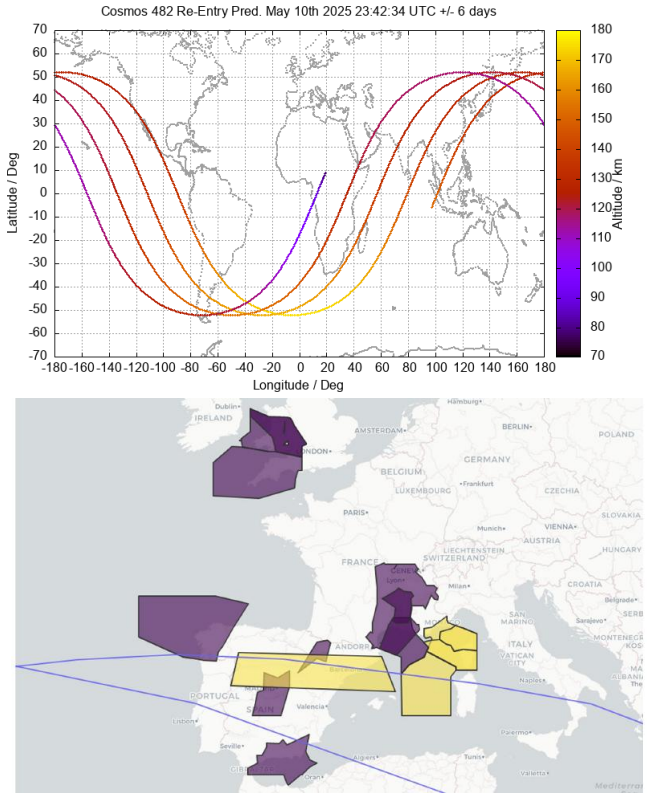
Institut für Raumfahrtsysteme

Student thesis announcement (BA/SA/MA)

Student Thesis and HiWi Opportunities in the IFF/IRAS Project SpaceATM (German/English)

Background

Spacecraft cross the controlled airspace at the beginning and end of their missions. These interactions represent a source of hazard for aircraft. Therefore, the airspace around the planned trajectory of a spacecraft is closed over a wide area. The closed areas are called Temporary Flight Restriction Zones (TFR) and Hazard Areas (HA). These restrictions affect the flight routes and lead to delays in air traffic. The current trends show an increase in flight schedules as well as in launches and satellite reentries. This increase and new launch concepts create the demand of a better understanding of the interactions between aviation and space activities. The Institute of Flight Guidance and the Institute of Space Systems work together in the project SpaceATM to model and analyze these interactions and generate techniques to reduce negative impacts. Several aspects need to be investigated and show a great opportunity for you to contribute.



Reentry Tracks and related TFRs and Has during an uncontrolled reentry of an upper stage [Wright, E., Boley, A., & Byers, M. (2025). Airspace closures due to reentering space objects. *Scientific Reports*, *15*(1), 2966.*]*

Possible Topics:

- Creation and evaluation of representative Air Traffic, Space Launch and Reentry activities
- Implementation and evaluation of aircraft rerouting strategies in a high-speed air traffic simulation
- Investigation of the impact of dynamic rerouting on airspace efficiency and drawing improvements
- Simulation of spacecraft fragmentations and collisions and assessing the effects on the overall system
- Investigation of the effects of wind on the trajectories of fragments, rockets, new launchers and spacecraft
- Investigation of the reentry survivability rate of fragments from new space launch concepts
- Modelling the position and velocity uncertainties of spacecraft during the launch and deorbiting

The exact scope and focus of your topic will be created together based on your interests and knowledge.

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 and optional coding (advantageous)

Start of the thesis: Any time from April 2025 onwards

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

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