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**Bachelor / Master Thesis Announcement**

# Development of a MATLAB based simulation tool for formation flight maneuver trajectories using differential lift and drag

Using several small, unconnected, co-orbiting satellites rather than a single monolithic satellite has many advantages. However, due to their tight volume and mass constrains other solutions than using chemical and/or electric thrusters to withstand given natural perturbations and/or to perform reconfiguration maneuvers are of highest interest. In VLEO, atmospheric forces are a possible solution for propellant-less relative motion control.

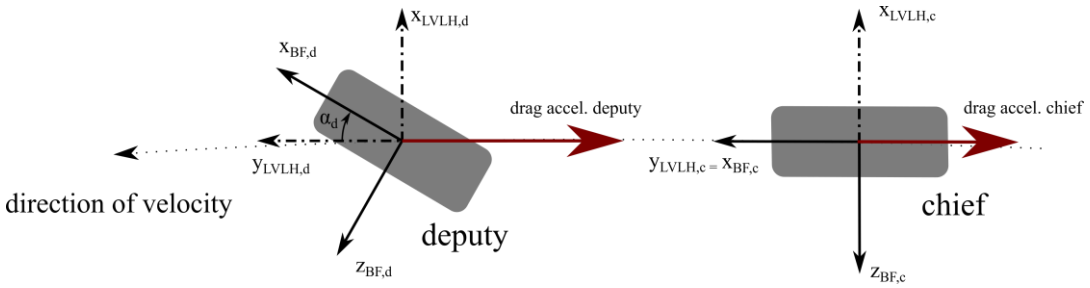


**Figure 1: Exemplary visualization of a negative differential drag configuration.**

Reference trajectories for aerodynamically controlled maneuvers are commonly designed using simplified algorithms which, due to their low computational burden, can also be applied for Monte Carlo type analysis. At the IRS, these algorithms are extended and refined since 2018 and an extensive amount of different maneuver algorithms has been developed. In order to make the different algorithms accessible and practically usable for various researchers and students, these developments need to be structured, harmonized and combined in a capable and flexible MATLAB tool intended to calculate the desired maneuver sequences based on the respective input parameters by the user.

Therefore, the task of this thesis is the definition of all requirements of the tool, the harmonization of the different maneuver algorithms as well as an implementation of a tool which fulfills all defined requirements. The functionality shall then be proven by performing a verification with previously published results.

Task description of the Bachelor / Master thesis work:

- Familiarization with the methodology of differential lift and drag;
- Familiarization with the available maneuver algorithms as well as their respective implementation;
- Definition of the requirements of the tool;
- Implementation of a tool which fulfills all requirements;
- Verification of the functionality / correct implementation of the algorithms;
- Critical assessment of the results and documentation.

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