TU/e student team Blue Jay develops drones for societal, medical, safety and human interaction applications. Their drones are often used in the outside environment where they can be used to assist us with various tasks related to monitoring, safety and transport. Inside buildings the proximity of walls makes flying risky as drones with a protective outer shell tend to “suck” itself towards a wall when they get too close. This makes flying in rooms and confined spaces impossible.

Blue Jay likes to know how the design of the outer shell and/or propeller ducts can eliminate this problem.

We propose to build a research set-up on which a drone can be mounted and where the lateral forces on a drone can be measured. In this way the effect of walls and ceiling under various boundary conditions can be investigated. We like to investigate the following themes:

- Can one understand the effect of the airflow between a drone and a wall on the lateral forces
- What is the effect of the outer (safety) shell on the flight behaviour
- Is there an effect on the lateral forces by changing the geometry (only propeller, propeller with duct, quadcopter with outer shell)
- Does the ceiling have a significant influence on the problem and what happens in a corner
- How does the airflow have to be changed to resolve the problem and ultimately how can this be achieved with a drone design

The approach in the current project starts from an experimental basis, but to understand the phenomenon, also a numerical study can be made. Numerically this could be tried using a simplified 2D approach using commercial fluid dynamics simulation software, like Comsol.

For the practical part, Blue Jay will supply drone related equipment: propellers, motors, controllers, drones etc. After the underlying phenomenon and flow are understood, possible solutions can be suggested. Here Blue Jay can help to implement the best proposals on an actual drone.

This project is intended as a 45-60 ECTS graduation project for a master student.

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