Drone Frame Topology Optimization

Background:

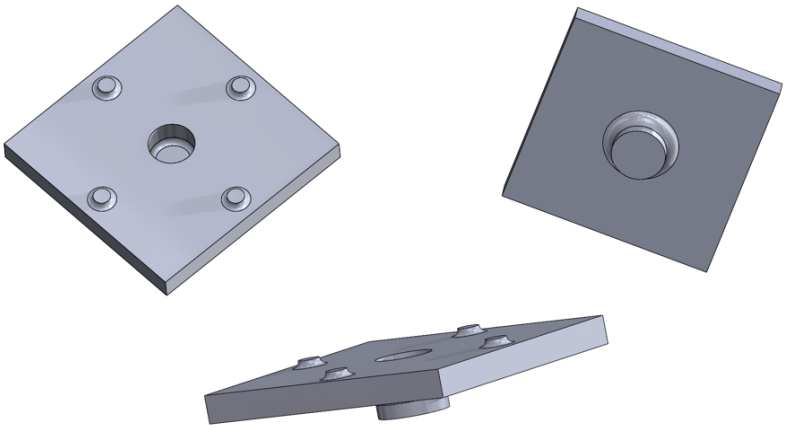
Drones have been around for decades, but they have become popular in recent years. This project will involve designing the **frame** through FEA and optimization. The frame is the central hub, manufactured to carry the load, and to hold battery, control unit, cameras, and other components.

DJI "Phantom 3" with camera

Airborne Drone "the Walker" with package

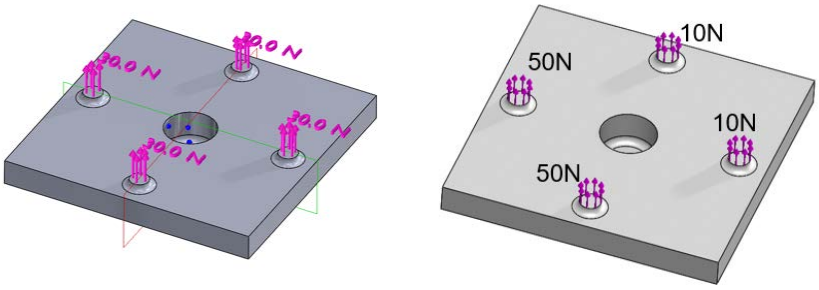
Frame Design:

- **Material**: ABS
- **Space constraint**: The entire frame should fit into the design space provided. The design domain is included in the ParetoExamples folder as **DroneFrameProblem.stl**

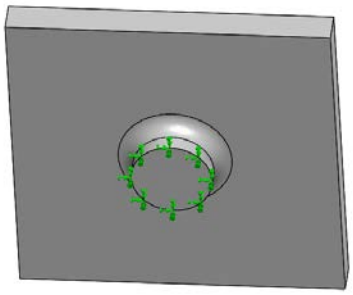


Frame must lie within this space

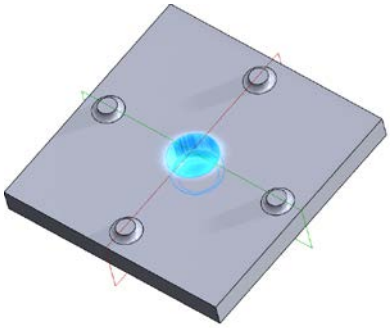
- **Loading**: Two different load-sets must be considered (total of 120 N thrust); the design must not fail under either of these loads



- **Restraints**: The bottom face is assumed to be fixed



- **Non-design**: All the surfaces in the cutout for the electronics must be retained (non-design surface).



- **Stress and Displacement Constraints**: (1) Max. von Mises < 4e6 N/m^2 (yield strength of ABS is around 40 MPa; and we are using a safety factor of 10), and (2) Max. deflection < 0.005 m
- **Topology optimization**: Use Pareto to carry out topology optimization, you can generate different topologies by playing around with the constraints and mesh size. Pick the right constraint based on FEA and intuition.