Objective: To design and optimize a landing gear with a small carrying apparatus that will be attached to a drone. This drone will be used to carry emergency medication from a nearby pharmacy to a hospital.

Background

Drone Research:
- Parts
- Function
- Performance

Further Research:
- Topology optimization
- Types of material testing for additive manufacturing materials

Japanese Wood Joinery:
- Inspiration for leg joint connection

Drone for Project
- Thanks to Drone Express

Design & Analysis

Design Iteration 1

Cross-section of legs:
- Circular (left) vs. Rectangular (right)

Design Iteration 2

Design Iteration 3 Static Analysis: Rectangular VS Circular

Stress (left) and Displacement (right) results from static analysis of design iteration 3 with (6 x 5) mm rectangular cross-section.

Final optimization of leg resulted in:
- R1= 57 mm, R2= 133 mm, R3= 62 mm

Design Iteration 3

FEA Optimization of leg:
- Minimize stress and weight
- Based off the 3 radii above

Design Iteration 4

Results

Printing: Landing gear legs/design iteration 3/design iteration 4—all ABS material

Static testing of landing gear assemblies and leg followed by dynamic testing of assembly.

Stress (left) and Displacement (right) results from static analysis of design iteration 3 with 5 mm diameter circular cross-section.

Stress (left) and Displacement (right) results from static analysis of design iteration 3 with 5 mm diameter circular cross-section.

Safety Parameters:
- Drone landing in enclosed cage on landing pad
- Careful communication between pilot and receiver
- Mandatory safety lessons

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