ES 1310 Term Project: Quadcopter with Hook Mechanism

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1 Introduction

The purpose of this project was to design a device in SolidWorks (SW) using a minimum of 6 parts. This report shows the design of a quadcopter chassis combined with a hook mechanism at the bottom of the drone. The idea for the project came from trying to investigate if a swarm of flying objects can collaborate together to lift and move certain items. By adding a hook mechanism, this model of a quadcopter is potentially able to transport small items from one place to another.

2 Part Drawings

Since there are two sub-assemblies and one final assembly, the drawings are separated by the parts used in each assembly.

2.1 Arm Parts

The arm assembly is composed of the boom (arm chassis), the boom landing gear, the motor and propeller, and the propeller head. The motor, an EMAX RS2306, and the propeller, a GWS 9050, are parts that will be outsourced. The propeller model was downloaded from GrabCad¹, while the motor model was designed in SW using 3D drawings of the motor provided by the manufacturer.

¹ https://grabcad.com/library/gws-9050-quadcopter-rotor-1





2.1.2 Boom Landing Gear



2.1.3 Propeller Head



2.2 Hook Parts

The hook assembly is composed of a servo, a servo horn and hook horn, and hook dowel and a hook base. Similar to the motor, the servo, a Hitec HS-422, is a part that will be outsourced. The simple design on the SW model was created using 3D drawings provided by the manufacturer as references.

2.2.1 Hook Base





2.2.2 Servo Horn



2.2.3 Hook Horn



2.2.4 Hook Dowel



2.3 Quadcopter Parts

The final quadcopter assembly is composed of two subassemblies, the arm and the hook, and three essential parts: The top and bottom base of the quadcopter, and the long landing gears to compensate for the hook assembly. Depending if the hook assembly is added or not, the long landing gears were designed to be replaced.

2.3.1 Long Landing Gear



2.3.2 Bottom Base













Assembly Drawings

This section explores the drawings of each subassembly and the final quadcopter assembly. Each subassembly drawing consists of two parts: (1) an exploded view with a BOM included, and (2) a non-standard orthographic view of the assembly with a Revision Table included.

3.1 Arm Assembly





3.2 Hook Assembly





3.3 Quadcopter Assembly





4 Issues

Drawing the parts was one of the hardest tasks since most parts consisted of a multitude of features. This not only made it hard to identify what needed to be dimensioned, but it made it hard to identify what was over-dimensioned. For future designs, I would add more sheets if there are too many dimensions.

5 References and Notes

5.1 Simulation Videos

Video on Explosions and Motion Studies: https://youtu.be/OKXjLFVJ22s

5.2 Part Number Naming Legend

QC: Quadcopter Part QC-A: Arm Subassembly Part QC-H: Hook Subassembly Part QCA: Quadcopter Assembly QCA-A: Arm Subassembly QCA-H: Hook Subassembly