MET 213 Glider Project

Grace Cox and Kai Mangiaracina

Materials and Construction

- **Wing**
    - Materials:
        - Balsa wood ⅛” THK
        - 2 ⅛” dowel rods
        - MonoKote
        - Super Glue

Figure 1: Wing prior to construction

    - Construction:
        - All parts were drawn up and laser cut at the BIDC. The wings support system consists of a series of balsa wood ribs that got smaller the farther they were from the center of the plane. The ribs are held together with a series of balsa wood rectangular shafts and dowel rods. The wing supports were then wrapped in Monokote to create the wings surface.

Figure 2: Wing with monokote

- **Fuselage**
    - Materials:
        - Foam core
        - Balsa Wood ⅛” THK
        - Electronics (see below)
        - Electric tape
        - Gorilla gel super glue
        - Blue sharpie

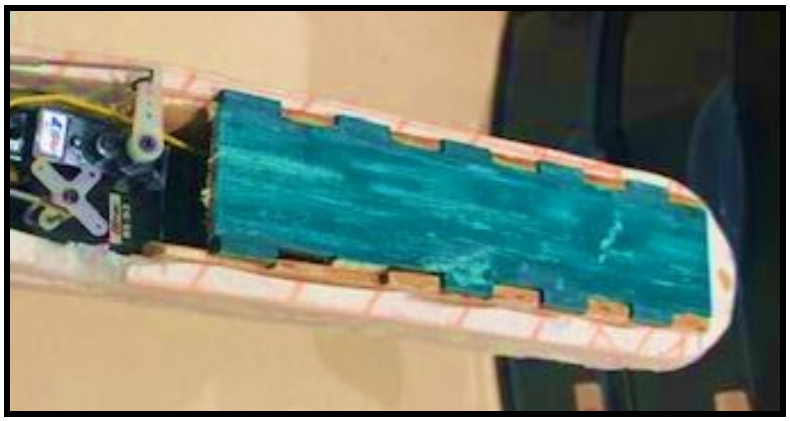

Figure 3: Fuselage with Lid on

    - Construction:
        - The foam core shell consisted of 3 layers of ½” thick layers that were 3 inches wide were hand cut, glued together and sanded down to have a more aerodynamic shape. The balsa wood box was drawn up in Autodesk Inventor and laser cut at the BIDC. The box and body was put together with gorilla gel super glue. This box supported the foam core body, and housed the lid for the body. The electronics were glued down to the balsa wood box.

- **Rudder/Elevator**
    - Materials:
        - Balsa wood ⅛” THK
        - Scotch tape
        - Blue sharpie
        - Gorilla gel super Glue

Figure 4: Finished Rudder/Elevator

    - Construction:
        - All Parts were drawn up on Autodesk Inventor and laser cut at the BIDC. extra rudders and elevators were cut just incase they broke during testing or actual flight. The rudder was super glued into a slit on the elevator. The blue pieces are able to steer up and down, or left to right. These pieces are held together by strips of scotch tape. The scotch tape is place on the fronts and backs of the part. The construction of these two parts was very easy.

- **Electronics**
    - Materials:
        - Battery - 30C 7.4 V
        - Voltage Regulator - HiTec
        - 2 Servos - HiTec HS 53
        - Receiver - TACTIC TR325
        - 2 pushrods
        - RC Controller (not apart of the glider)

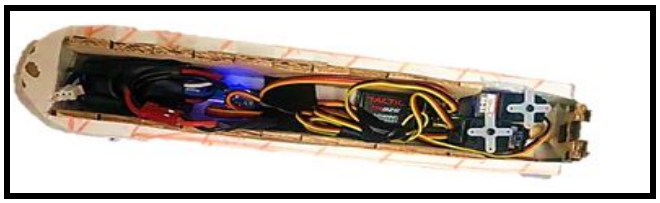

Figure 5: Complete electronics

    - Construction:
        - The “construction” of the electronics was very easy. This involved simply connecting all the parts together correctly. To do this, the 7.4 V battery had to be connected to the voltage regulator before being connected to the receiver. This was because the receiver, and servos, could only take a maximum of 5 V. Once the voltage regulator was connected to the battery, the regulator could then be plugged into the receiver; which also housed the two servo plugs. Depending on where you plugged the servos into the receiver, this determined how you could control the rudder and elevator with the RC controller.

Results from the Flight

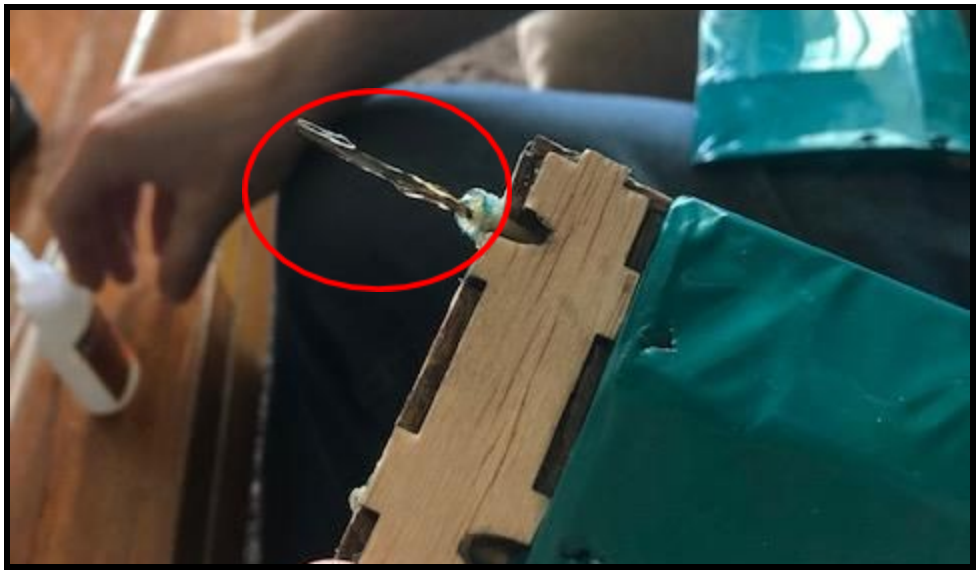

Figure 6: Metal Implant Covered in Super Glue

- The flight went better than planned considering the wing fell off after the first throw. This called for a wing "implant". This implant consisted of a metal drill bit taking the place of a ⅛" Thick dowel rod. After the last minute fix we were able to get our glider to consistently fly 30 meters or more. This lasted till another hard landing occurred where our other wing broke off. This wing also received the metal implant, but unfortunately, the metal drill bit gave the body and wings too much stress. This caused the skeleton of the wings to completely break, making another fix basically impossible.

Weight

- Wing - 48 gm
- Fuselage/electronics - 75 gm
- Rudder/Elevator - 14 gm
- Pushrods - 13 gm
- **Total – 150 gm**

Estimate of Flight Speed

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Surface area (s) = (1*.17) - (.5*.07*.5) = .153m^2

L= ½ C_L* p* v^2* s

Rearranged

V = sqrt((2*m*g) / (C_L*p*s))

= sqrt((2*.150*9.81) / (1 * 1.2 *.153)

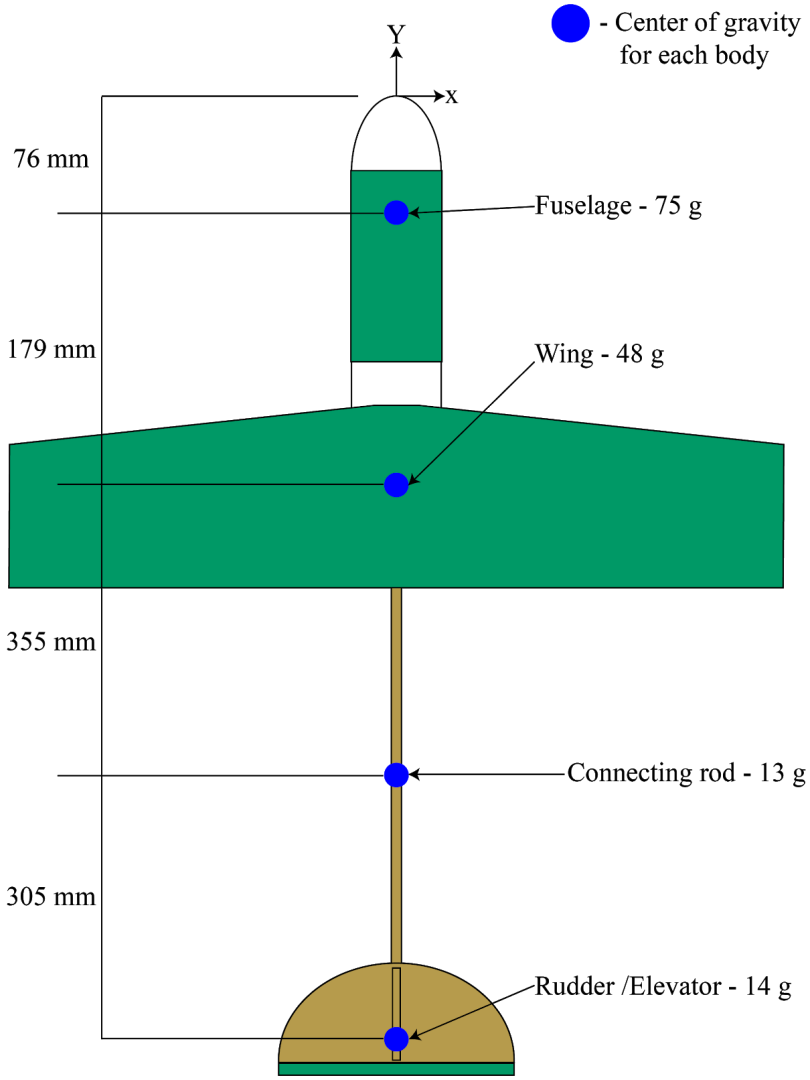
= sqrt((2.943) / (0.1836)

= sqrt(16.029412)

V = 4.003675m/s → **8.956 mph**

Our end velocity was 8.96 MPH according to the calculations using surface area, the coefficient of lift, and the density of air.

Picture of the Glider's Weight Distribution



	Mass (g)	Y (mm)	V(Y)
Fuselage	75	76	5,700
Wing	48	255	12,240
Connecting rod	13	610	7,930
Rudder / elevator	14	915	12,810
Σ	150	x	38,680

Y = 38,680 / 150 => Y = 257.9 mm

The center of gravity of the glider is 257.9 mm from the front tip of the glider.