

# YIN-YANG

Designed By: Terry Dunn  
Drawing By: Dan Sponholz  
Version: 1.0  
Date: 2020.09.21



## General Specifications:

Length:	29.5 in (749 mm)
Center of Gravity:	2.0 in (51 mm)
Wingspan:	30.0 in (762 mm)
Wing Area:	233 in <sup>2</sup> (15.0 dm <sup>2</sup> )
Dry Weight:	12.5 oz. (355 g)
All Up Weight:	15-20 oz. (425-567 g)
Wing Loading:	9.3-12.4 oz/ft <sup>2</sup> (28-38 g/dm <sup>2</sup> )
Wing Cubic Loading:	7.3-9.7

## Recommended Settings:

Channels:	4 (T A E + Differential)
Throws:	High = +/- .5" Low = +/- .25"
Expo:	30%

## Recommended Electronics:

Motors:	2X 75-150 watt
Propellers:	2X 5 x 4.5 BN Master Airscrew
ESCs:	2X 8 amp min.
Servos:	3X 9 gram
Batteries:	2X 450-850 mAh 2-3S LiPo

## Material:

This model is designed to be built with 3/16 inch thick x 20 x 30 inch ADAMS foam board with a weight per sheet of approximately 4 oz. The foam board can be purchased from Flite Test or local Dollar Tree stores. Use of heavier foam boards may affect flight performance.

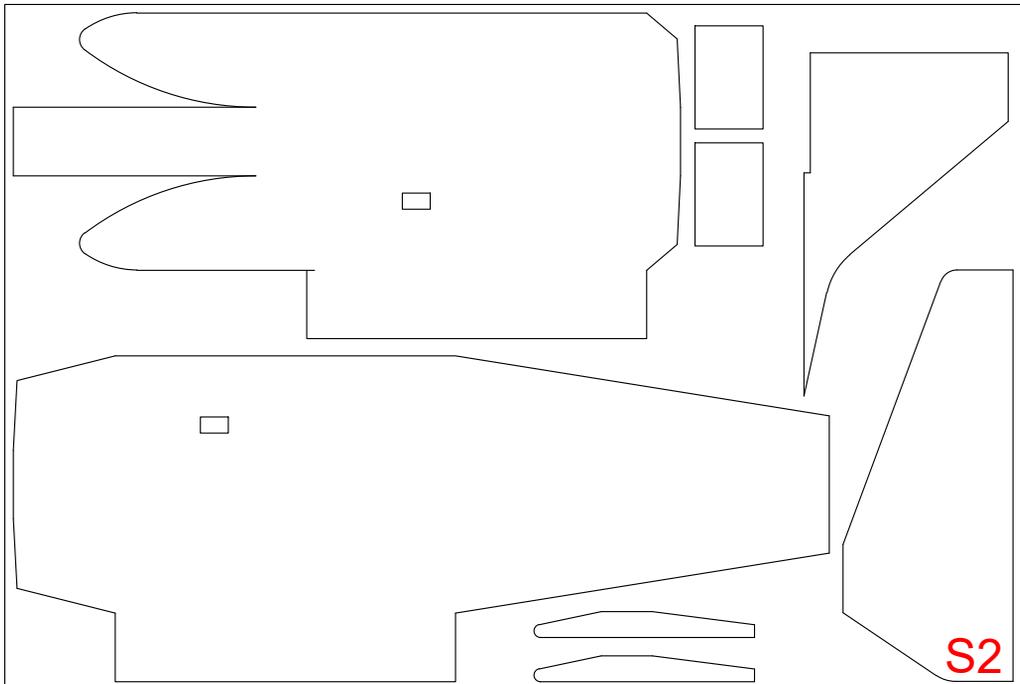
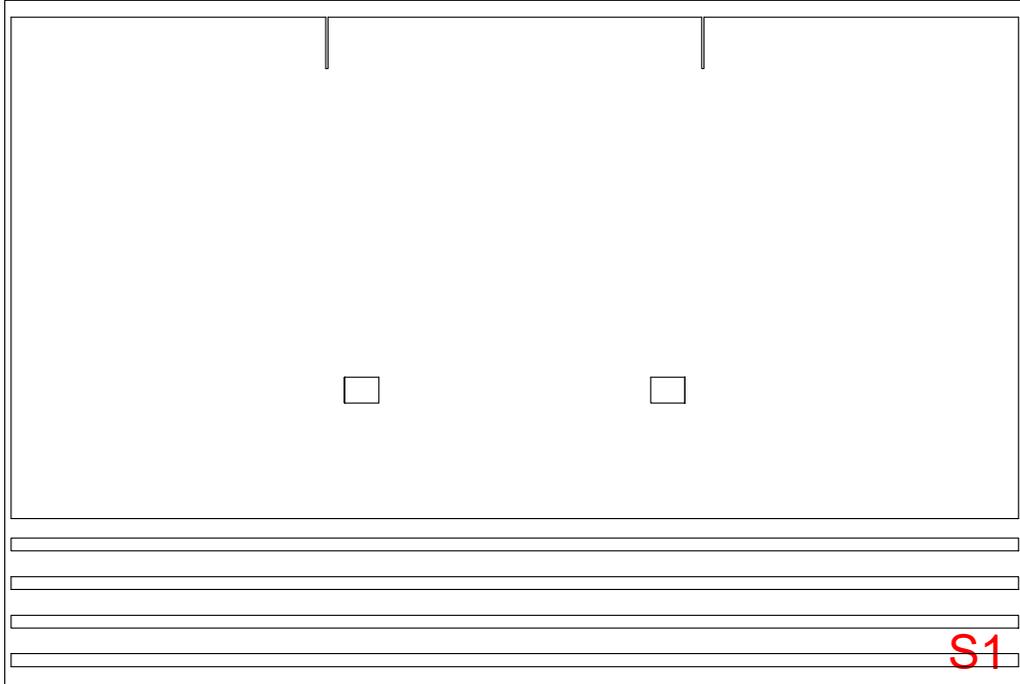
## BUILD SKILL LEVEL:



## PILOT SKILL LEVEL:

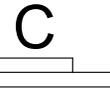
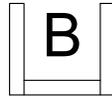


# Yin-Yang: Full-Size Key



# Drawing Key

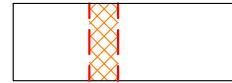
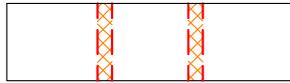
## FOLD TYPES



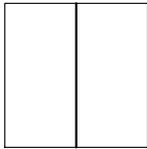
A - FOLD (ABOVE)

B - FOLD (BESIDE)

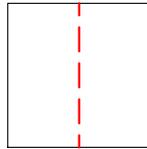
C - FOLD (COVER)



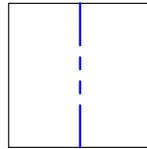
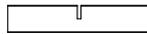
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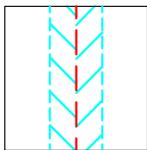
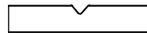
CUT



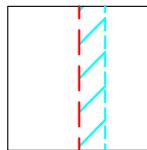
50% SCORE



CREASE



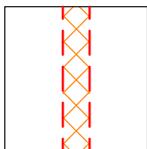
45° DOUBLE  
BEVEL



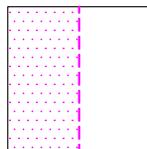
45° SINGLE  
BEVEL



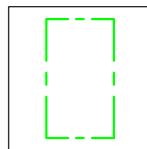
EDGE  
BEVEL



CAVITY



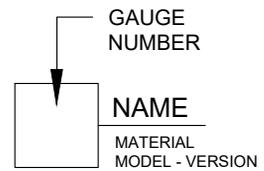
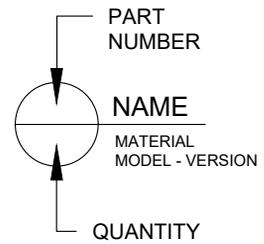
REMOVE  
PAPER



REFERENCE/  
OPTIONAL



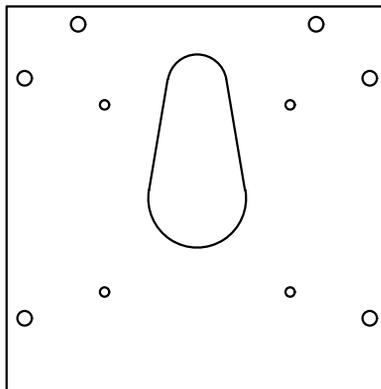
## SYMBOLS



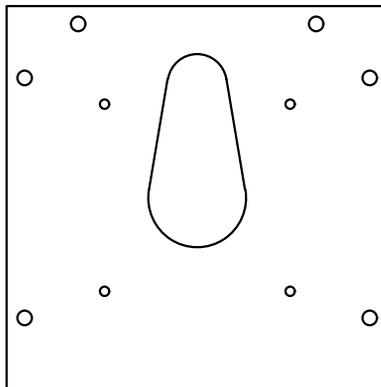
CENTER  
OF  
GRAVITY  
(CG)

# Yin-Yang: Wood Parts

HOBBY GRADE PLYWOOD  
3/32" (2.4 mm) THICK



PLYWOOD FIREWALL  
2 REQUIRED



**Yin-Yang Build Directions:**

**Wing**

- The wing is built from a single sheet of 30" x 20" foamboard.
- Cut four 30"x 3/8"-wide strips from the foamboard.
- Create a wing spar by gluing one strip on top of another (paper to paper) using a thin film of Elmer's white glue. Use weights or tape to stabilize the parts and allow several hours for the glue to dry.
- Create a second wing spar by repeating step 3 using the remaining two strips.
- While the spars are drying, cut the wing outline from the foamboard. Also cut out the servo wire exits as marked on the plans.
- Decide which side of the foamboard will be the inside surface and mark it with a pencil. All marks and cuts will be made on this inside surface.
- Referencing the plans, mark the inside surface of the wing with the locations of the wing leading edge, the top skin cuts, and the ailerons.
- Using a sharp hobby knife or razor blade, slice the foamboard along the leading edge line. Be very careful to cut through only the inside paper layer and foam. Do not cut through the outer paper layer.
- Fold the foamboard 180-degrees along the leading edge cut.
- Cut a 45-degree bevel along each side of the fold. Be careful to avoid cutting through the outer paper at the fold.
- Carefully fold the foamboard in the opposite direction. Apply gentle pressure along the fold until you create a nice rounded shape on the outside surface of the leading edge.
- Lay the wing panel flat on the table and slice the inside surface of the foamboard along the two top skin lines. Do not cut through the outer paper layer.
- Run the thin edge of a craft stick along the cuts to create a slight gap in the foam. This will allow the top skin to bend slightly inward along the cuts.
- Once the spars are fully dried, glue them to the bottom skin of the wing panel (paper to paper) with Elmer's white glue.
- Apply a thin layer of Elmer's white glue to the following areas:
  - The top of both spars
  - The rear 1/8" of the inner surface of the bottom skin
  - The beveled faces of the leading edge
- With the bottom of the wing panel on a flat table, carefully fold over the top skin until it contacts the spars in the midsection and the rear edge of the bottom skin. The ailerons on the top skin should protrude past the rear of the bottom skin.
- Set weights on the top of the wing along the spars and trailing edge. Allow to dry for several hours.
- Use scrap foam to cover the open wing tips.

**Right and Left Fuselage**

- With careful planning the remaining airframe components can be cut from a single piece of 30" x 20" foamboard.
- Cut out the Left Fuselage, Right Fuselage, Horizontal stabilizer, Vertical Stabilizer, and two battery trays.
- Cut out the servo wire exits from the Left Fuselage and Right Fuselage.
- Decide which side of the foamboard will be the inside surface of the Left Fuselage and mark it with a pencil. All marks and cuts will be made on this inside surface.
- Cut and remove the foam and inner layer of paper where indicated on the plans. Be very careful to cut through only the inside paper layer and foam. Do not cut through the outer paper layer. The foam should easily peel away from the outer layer of paper with slight pressure.
- Make relief cuts on the Right Fuselage where indicated on the plans. Be very careful to cut through only the inside paper layer and foam. Do not cut through the outer paper layer. Remove the paper between these cuts.
- Lay the Right Fuselage flat on the building surface with the inside surface facing up.
- Apply a light layer of white glue to the edge of each side panel where they meet the top panel.
- Rotate the side panels so they are vertical and the edge of each panel sits on the top panel.
- Use tape and/or weights to hold the side panels in position and allow the glue to dry for several hours.
- Repeat steps 7-10 on the Left Fuselage.
- Remove the paper layer from one side of each battery tray.
- Optional: Glue a strip of thin plywood (1/64" to 3/32" thick) to the bare side of each Battery Tray.
- Glue a strip of Hook and Loop tape to each Battery Tray using 5-Minute epoxy. If present, glue to the optional plywood strip.
- Apply a thin layer of white glue to the side edges of each Battery Tray and install them in the Right and Left Fuselage.
- Apply a thin layer of white glue to the edges of the Forward Fuselage sides where the top panel wraps around.
- Set the top panel of the Right Fuselage in place. Use low-tack masking tape to keep the top panel in position until the glue has dried.

**Firewall**

- Cut out the two Firewalls from 3/32" plywood.
- Drill the holes necessary to mount your chosen motors and route the wires through the Firewall.
- Obtain a package of round toothpicks, these will be used to strengthen the glue joint between each firewall and its attached fuselage.
- Drill two holes each along the top and side edges of the firewalls. These holes should be sized so that the toothpicks can be pushed through them with light pressure.
- Cut 6 toothpicks in half using sharp side cutters.
- Apply white glue to the rear edge of the Right Fuselage where the Firewall is to be installed.
- Place the firewall in position on the Right Fuselage. Use low-tack masking tape to hold the firewall in place.
- Apply a drop of white glue to the sharp end of a toothpick half.
- Carefully push the toothpick half through a hole in the Firewall and into the foam of the Right Fuselage. It is okay if the toothpick protrudes out of the firewall. This will be trimmed later.
- Apply glue and push the toothpick halves into the remaining 5 holes of the firewall.
- Repeat steps 6-10 on the Left Fuselage.
- Allow to dry for several hours.
- Use a pair of sharp side cutters to trim the toothpick halves flush with the firewalls. A sanding block may be used to make the joints even smoother.

**Control Surfaces**

- Place the horizontal stabilizer on the work surface with the bottom side facing up. Cut along the hinge line. Be very careful to cut through only the bottom paper layer and foam. Do not cut into the top paper layer.
- Draw a line on the elevator that is approximately 3/16" behind the hinge line.
- Cut along the line with the blade angled towards the hinge line. This should remove a wedge-shaped piece at the hinge line. The top paper layer acts as a hinge.
- Spread a very thin layer of white glue along the inside of the hinge line to prevent delamination.
- Optional: Cut a slit into the horizontal stabilizer approximately 3" forward of the hinge line. Insert a 1mm x 3mm flat carbon fiber spar into the slit. Secure with foam-safe CA or white glue.
- Cut both ailerons free, repeating the same method used with the elevator. Again, the top paper layer should be left intact as a hinge.
- Install three Du-Bro Micro Razor Control Horns (part #936) to the elevator and ailerons where indicated on the plans. Secure with 5-minute epoxy.

**Join Sub-Assemblies**

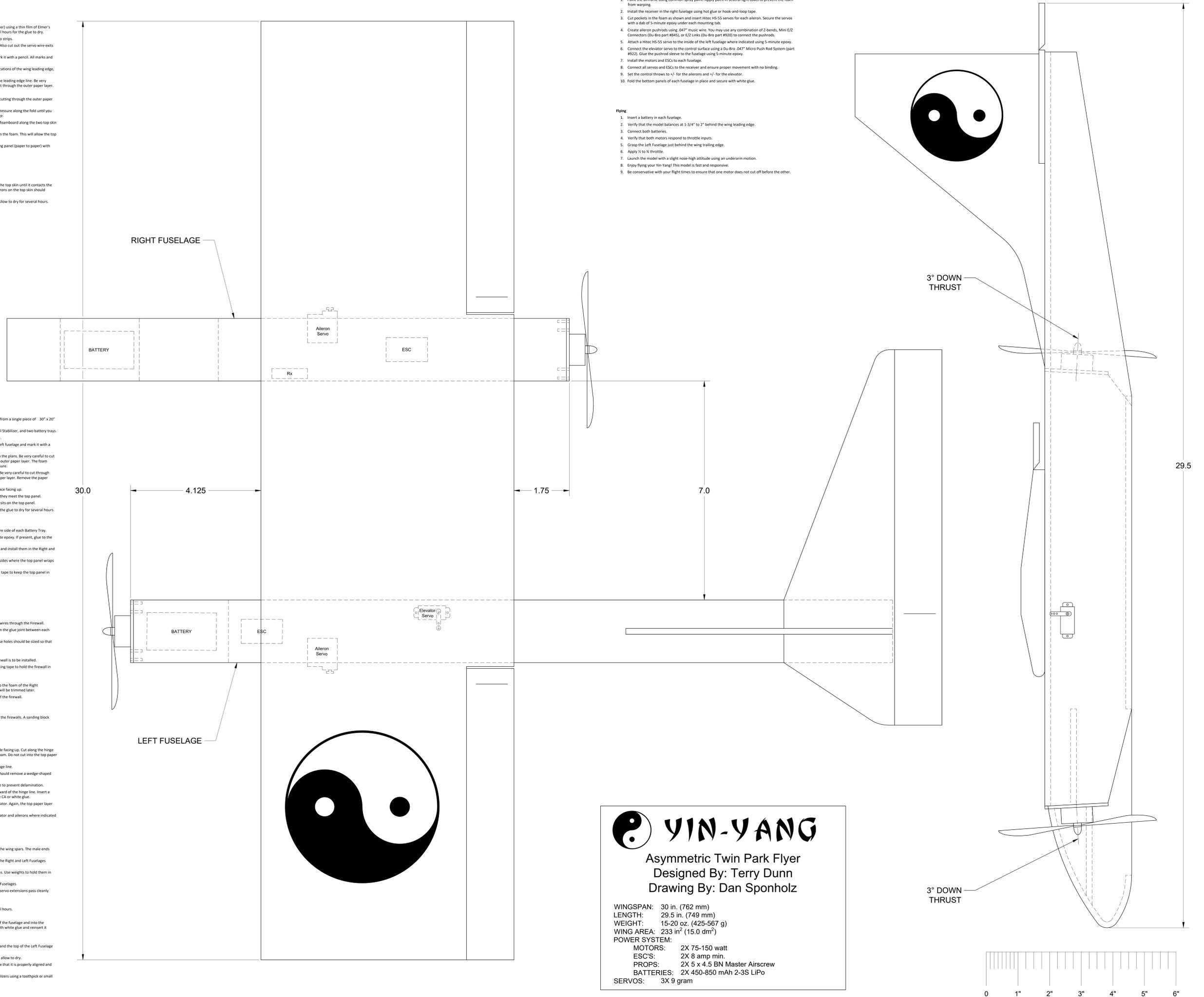
- Route three 12" long servo extensions through the channel between the wing spars. The male ends of the extensions should emerge from the right side of the wing.
- Remove the outer paper from the bottom of the wing and the top of the Right and Left Fuselages where these parts will be joined.
- Set the Right and Left Fuselages in position on the top view of the plans. Use weights to hold them in position.
- Spread a layer of white glue where the wing meets the Right and Left Fuselages.
- Set the wing in place on the Right and Left Fuselages. Ensure that the servo extensions pass cleanly through the exit holes in the top of each fuselage.
- Verify that all components are aligned correctly.
- Add weight to the top of the wing and allow the glue to dry for several hours.
- Remove the weights and lift the airframe from the work surface.
- From inside the Left Fuselage, push a toothpick half through the top of the fuselage and into the front surface of the wing. Remove the toothpick, cover the point with white glue and reinsert it into the hole.
- Repeat step 9 until six to ten toothpicks are placed in each fuselage.
- Remove the outer paper from the bottom of the Horizontal Stabilizer and the top of the Left Fuselage where the tail feathers are joined.
- Glue the Horizontal stabilizer to the Left Fuselage with white glue and allow to dry.
- Glue the Vertical Stabilizer to the Left Fuselage with white glue. Ensure that it is properly aligned and allow to dry.
- Optional: Add a small brace between the Horizontal and Vertical Stabilizers using a toothpick or small dowel secured with white glue.

**Final Assembly**

- Paint the airframe using common spray paint. Apply paint in several light coats to prevent the foam from warping.
- Install the receiver in the right fuselage using hot glue or hook-and-loop tape.
- Cut pockets in the foam as shown and insert Hitec HS-55 servos for each aileron. Secure the servos with a dab of 5-minute epoxy under each mounting tab.
- Create aileron pushrods using .047" music wire. You may use any combination of Z-bends, Mini EZ Connectors (Du-Bro part #845), or I/Z Links (Du-Bro part #920) to connect the pushrods.
- Attach a Hitec HS-55 servo to the inside of the left fuselage where indicated using 5-minute epoxy.
- Connect the elevator servo to the control surface using a Du-Bro .047" Micro Push Rod System (part #920). Glue the pushrod sleeves to the fuselage using 5-minute epoxy.
- Install the motors and ESCs to each fuselage.
- Connect all servos and ESCs to the receiver and ensure proper movement with no binding.
- Set the control throws to +/- for the ailerons and +/- for the elevator.
- Fold the bottom panels of each fuselage in place and secure with white glue.

**Flying**

- Insert a battery in each fuselage.
- Verify that the model balances at 1-3/4" to 2" behind the wing leading edge.
- Connect both batteries.
- Verify that both motors respond to throttle inputs.
- Grasp the Left Fuselage just behind the wing trailing edge.
- Apply 3/4 to 1/2 throttle.
- Launch the model with a slight nose-high attitude using an underarm motion.
- Enjoy flying your Yin-Yang! This model is fast and responsive.
- Be conservative with your flight times to ensure that one motor does not cut off before the other.

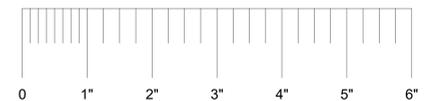


## YIN-YANG

**Asymmetric Twin Park Flyer**  
 Designed By: Terry Dunn  
 Drawing By: Dan Sponholz

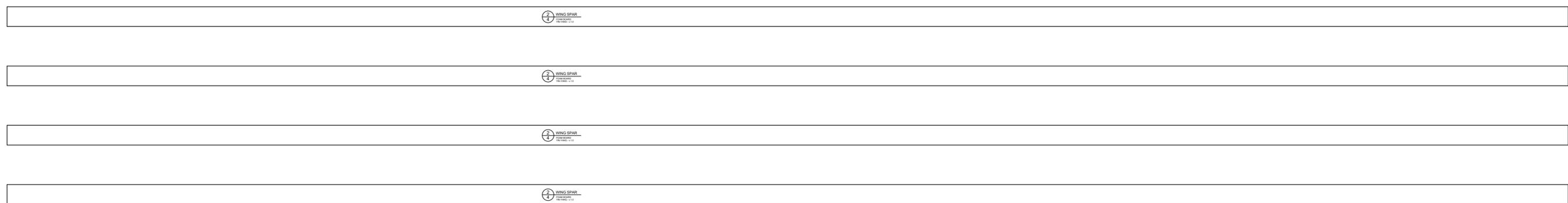
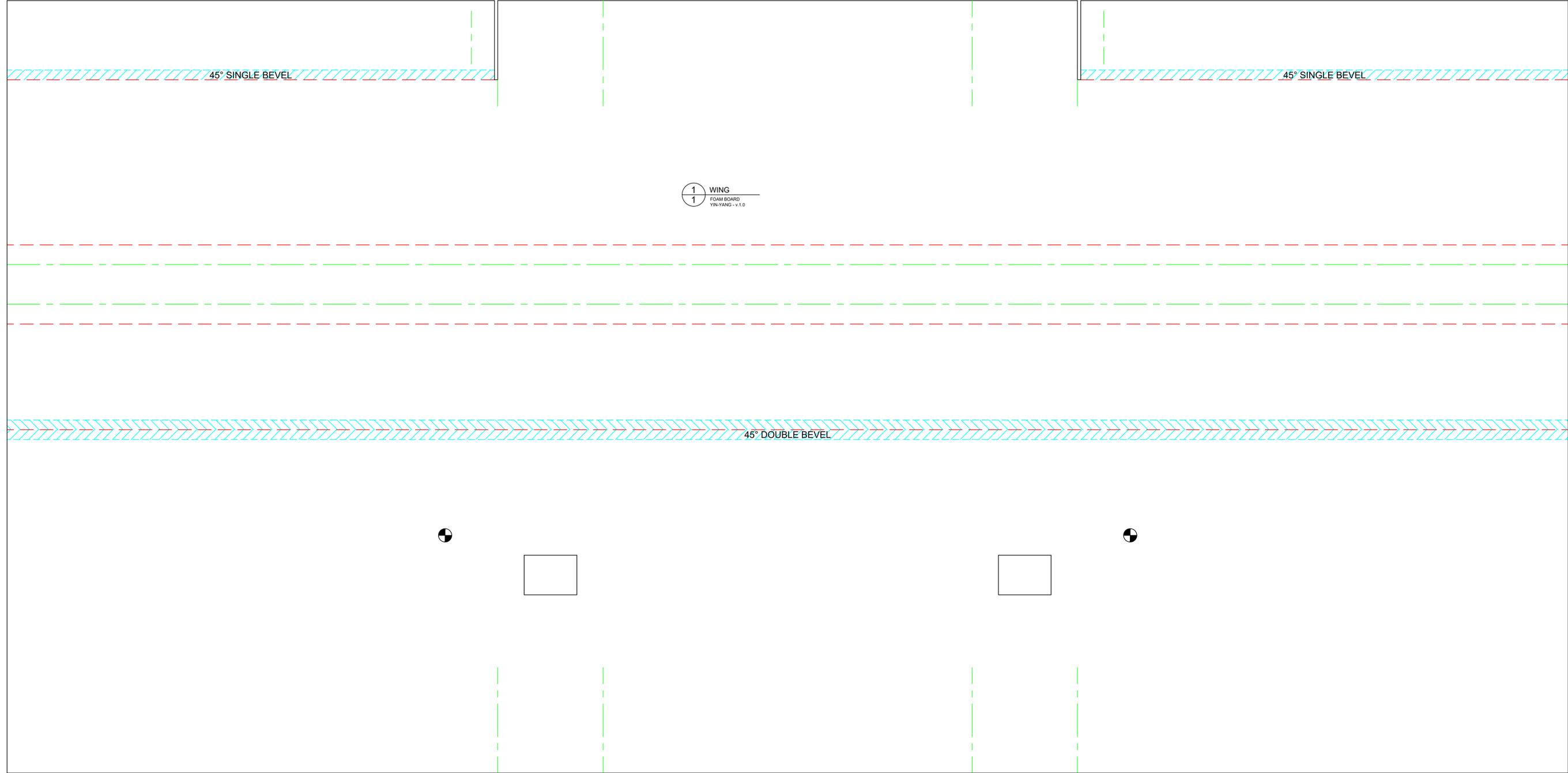
WINGSPAN: 30 in. (762 mm)  
 LENGTH: 29.5 in. (749 mm)  
 WEIGHT: 15-20 oz. (425-567 g)  
 WING AREA: 233 in<sup>2</sup> (15.0 dm<sup>2</sup>)

**POWER SYSTEM:**  
 MOTORS: 2X 75-150 watt  
 ESC'S: 2X 8 amp min.  
 PROPS: 2X 5 x 4.5 BN Master Airscrew  
 BATTERIES: 2X 450-850 mAh 2-3S LiPo  
 SERVO'S: 3X 9 gram



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