GYM-STAR

Designed by Andy Whitehead

Thank you for purchasing the Gym-Star from FLYING DOG and GRAPE. The Gym-Star is intended as both a high-wing trainer and also a 3D model for someone who wants something a little different from the usual 'Shockflyer' and can perform all the usual 3D tricks, from hovering (prop-hanging) to knife edge, etc.

The Gym-Star can be flown both indoors or out in calm conditions, however, if you are intending on flying mainly indoors, please pay special attention to keeping the weight as low as possible.

All models fly slower with a lower wing loading, so consider carefully the radio equipment to be used.

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Equipment

Many servos and motor/ESC combinations are perfect for this model, but listed below are some recommendations of gear that the design team have tried and know to work well:

Either:

1 x 9g servo for ailerons – e.g. Hexatronic HXT9 or Inolab HD201HB

Or…

2 x 5g servo for ailerons – e.g. Hexatronic HXT5, Dymond D47 or HiTec HS-35

2 x 5g servos for rudder/elevator – e.g. Hexatronic HXT5, Dymond D47 or HiTec HS-35
1 x 6-10 Amp ESC – e.g. Turnigy Plush 6A, HobbyWing Pentium 10A
1 x 40 Watt+ motor – e.g. A2812-14 (1600kv)

Batteries should be in the 2S 250-350mAh range with a propeller to match the selected motor (8x4.3 GWS Slow-fly in the case of the suggestion above).

Construction

Anyone who has built an EPP shockie before should find this plane's construction fairly normal, however, we always recommend that you read these instructions before commencing; the designers have built numerous indoor airframes and you may find a few tricks that aid in constructing straighter, lighter planes.

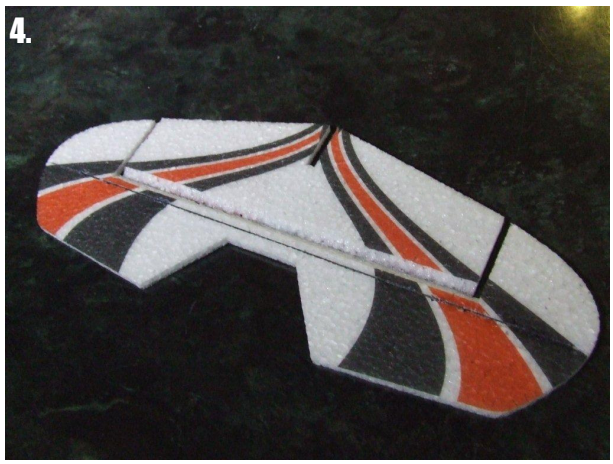
A few notes on glue... the Gym-Star is constructed mainly from EPP foam which, while extremely durable, does not bond well with certain types of adhesive. Foam Safe CA and Epoxy Resins do not work well, so should be avoided.

While normal CA can be used for most of the construction, the FLYING DOG team have extensive knowledge of EPP aircraft and recommend UHU POR for foam to foam joints, as it produces a flexible bond which resists impacts.

For foam to carbon, or foam to carbon/glass-fibre we have found medium CA to give the strongest bond.

1. Locate each wing panel and its corresponding aileron. Apply a small bead of POR to the bevelled edge of both. Go easy though, as too much glue will result in a stiff hinge, overloading the aileron's servo.

2. Wait 5-10 minutes for the glue to go tacky, then on a flat surface, press the two together to form a surprisingly durable hinge. Also join the two halves of the wing together using POR or CA (our preference is POR).

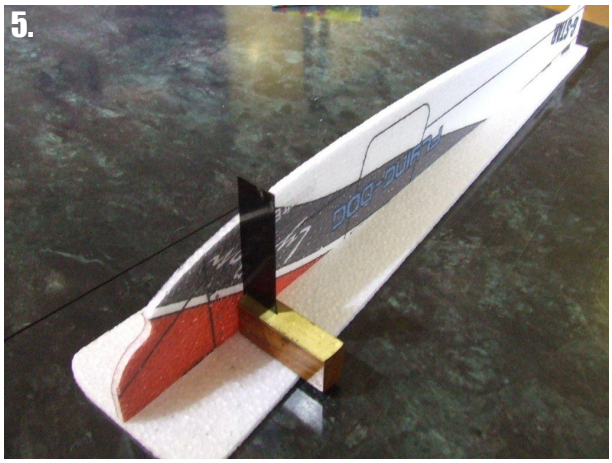


3. Locate the 3 x 0.5mm carbon strip and cut it to 760mm long to form the wing spar. [1] With the wing on a flat surface, push the spar into the slot and fix with CA. Weight the whole thing down as the glue sets. [2]

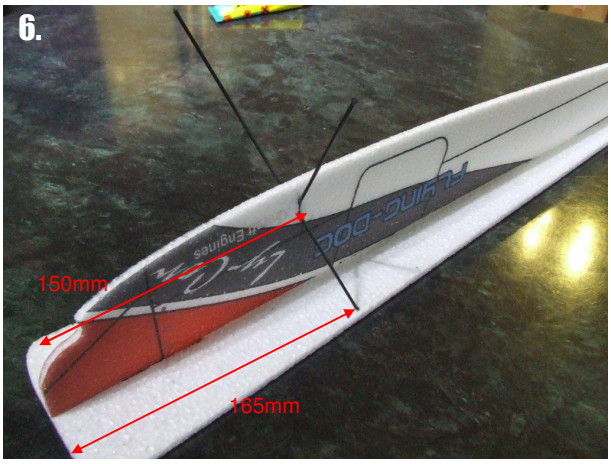
4. Glue the spar into the elevator with CA and create the POR bead hinge, the same as per the wing.

5. Using either POR or medium CA, glue the bottom part of the fuselage (the red printed nose scallop faces down) to the horizontal piece, checking everything is square and straight. [3]

POR is ideal for this join as it gives working time for alignment.



[1] The remaining piece is for the elevator, so don't throw it.
[2] We've found cold beer works well, as the condensation prevents the CA sticking to the bottle.
[3] CD cases make ideal temporary set-squares if you don't own a proper one.



6. Cut the 2mm carbon rod into 200mm lengths. Slit the foam and insert the rods to form the under-cart. Fix with medium CA. [4]

7b. Don't fix with glue just yet. Work your way down the fuselage, inserting carbon stiffeners in the same configuration as the picture.

When completed, check the whole thing is square and straight and adjust accordingly. When you are satisfied it's true, fix each joint with medium CA.

There are various configurations for the aileron servo/servos on the Gym-Star. Although not necessarily the most aesthetically pleasing, probably the easiest way is to simply mount the servo on top of the wing! If, however, you do want a cleaner look, it can also be mounted under - though this is a little more fiddly.

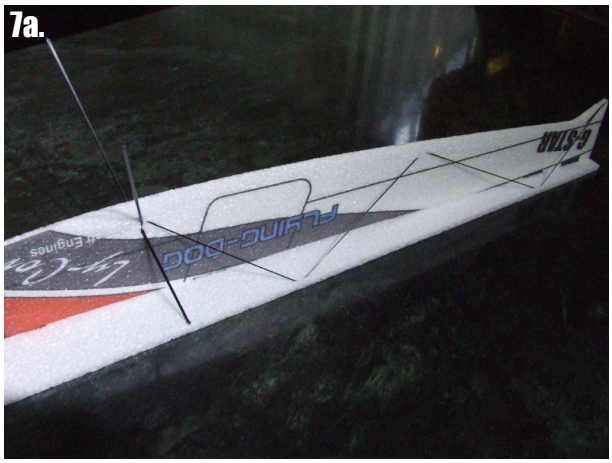
The final option is to use two servos for the ailerons, which then gives you the facility to adjust the differential and use flap mixes, etc.

The first (on top of the wing) option is pretty straight forward, so we'll deal primarily with the latter two.

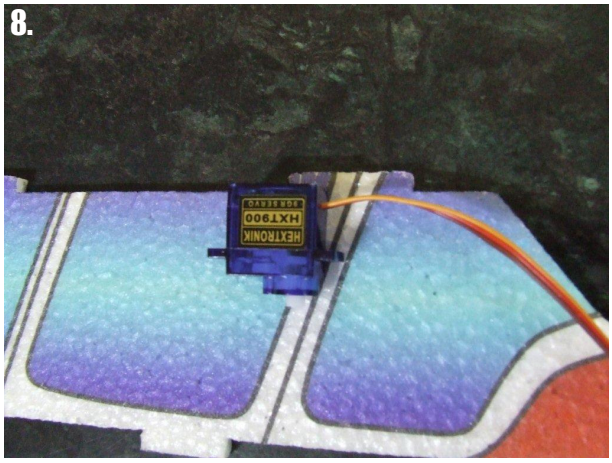
8. Underwing Servo: Position the servo (spline forward) onto the upper vertical fuselage and cut around it so the servo is a tight fit into the foam. Remove the servo, attach it to the RX and centre it.

With a double horn fitted, CA on the supplied horn. When the CA is set, the arm can then be secured by frapping with cotton/thread soaked in CA.

Push the servo back into the fuselage, check the horn moves freely and attach the wing. Attach a Z bend to a piece of 2mm rod and with it fitted to the servo horn, with the pushrod at 90 degrees (see picture 9) cut it to length, so the end of the rod is directly over the hinge line. Repeat for the other side.



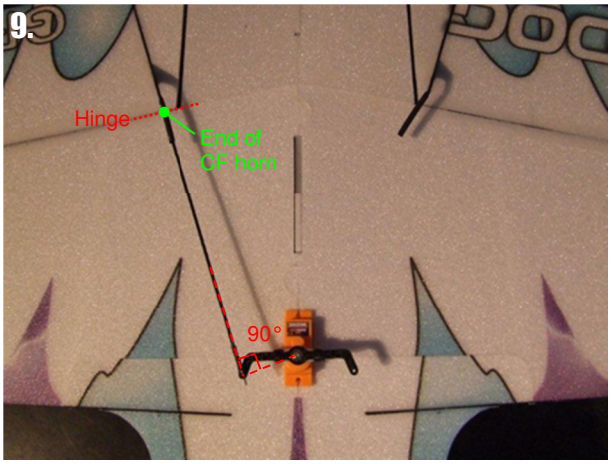
7a. Cut two pieces of 1mm carbon rod into roughly 130mm lengths and insert into slits cut with a scalpel starting from the under-cart.



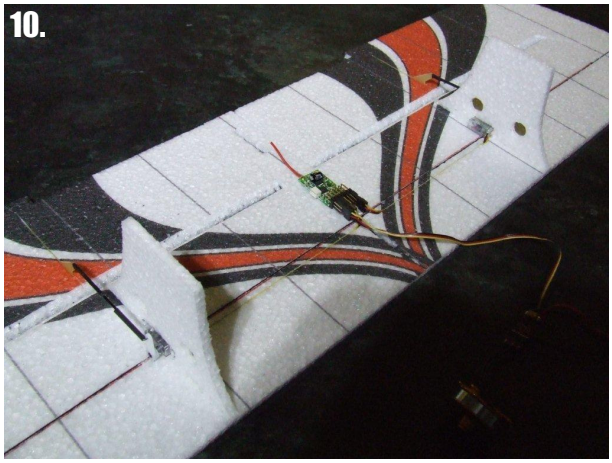
Remove the pushrods and secure the aileron horns using heat shrink. With the pushrods refitted, mark and cut slits for the aileron horns.

Do not glue the horns into the ailerons at this stage; once the wing and bracing have been fitted the horns can be adjusted in the slits to centre the ailerons before fixing with CA.

[4] Use the dimension provided rather than going by the photo – we'll let you guess why ☺



9. Taken from another airframe, this picture shows the correct orientation of servo horn [5], push rods, hinge line and aileron horn. [6]

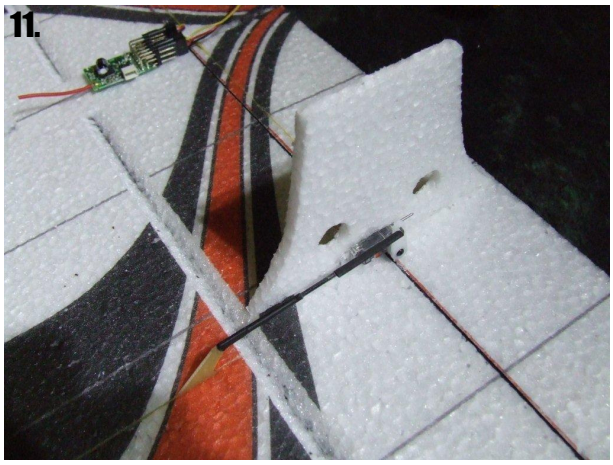


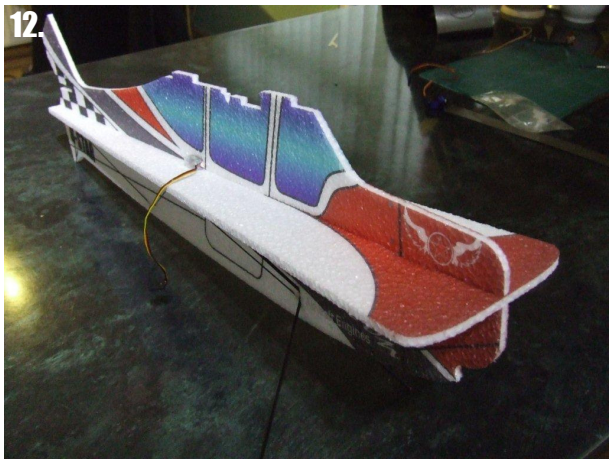
10. Two Servo option: The RX was placed on the underside of the wing and the servo wires pushed into slits, cut with a scalpel, to neaten the whole installation.

11. The servos were glued using POR into holes cut in the under-wing braces. We adjusted the position of the braces to suit the length of wires on the servo, but obviously don't deviate wildly from the photos.

Z-bends were CA glued and heatshrunk to the carbon push-rods at the servo horn end before being cut to length so that the carbon lines up with the hinge line.

Join the pushrod and aileron horn using a short length of heatshrink as a hinge. With the pushrods fitted to the servo, mark and cut slits for the aileron horns, bonding the horns with CA after making sure the servos are centred.





12. Attach the upper vertical fuselage to the lower assembly. Check that it's straight and square.

13. On a flat surface, weight down the wings and glue on the fuselage assembly. Check the whole thing is square and attach the 1.5mm wing braces. The ends of the braces are pushed into small slits

[5] The biased arm should faces forward (like the horns on a bull).
[6] The angle between the servo centre, linkage hole and the aileron horn is 90°.

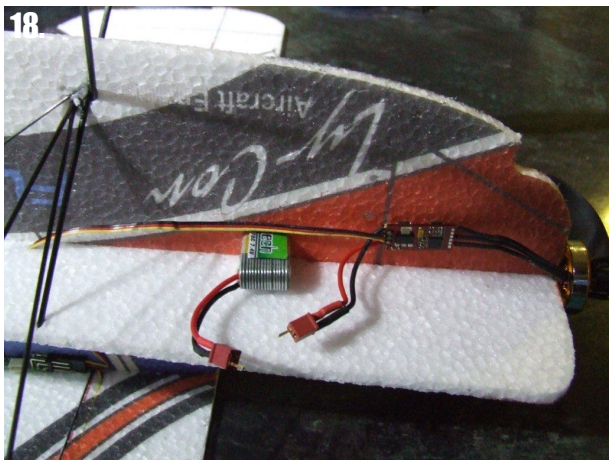
before fixing with CA.

14. Glue on the tailplane, check for alignment, then attach the 1mm bracing.

15. Attach the rudder and upper 1mm bracing.

16. Elevator/rudder pushrod assembly. Carbon cut to align with the hinge line and heatshrunk to horn. Remember to slide the guides on first.

17. Equally space each guide, cutting a slit for each in the foam. Check that the pushrods move freely and are straight, then fix guides to the fuselage with CA.



18. Position of the ESC.[7] Battery position adjusts the Centre of Gravity; as a rough guide for the first flight, set it about 10mm behind the carbon wing spar.

19. Finally sit back with your favourite beverage and admire your handy work. Your choice of beverage may vary, but we used the cold bottles from **3**.

[7] Radio gear installation can be tidied using POR and small strips of cross-weave tape to fix cabling.

Set-up

Dual-rates:

- Ailerons 50-100% (±45° max.)
- Rudder 70-100% (±45° max.)
- Elevator 50-100% (±55° max.)

Expo:

- Ailerons 25-50%
- Rudder 10-25%
- Elevator 15-30%

If using 2 servos in the wing, we found 20-25% differential improved the rolls axially.

A flap mix may be set-up with about 55% of down flap mixed to about 35% down elevator.

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Credits

Designer	**Andy Whitehead**
Artwork & Manual	**Kev Cross** **Gaz Holland**
Production & Manufacture	**Adam Osinski** **Marcin Traczyk** **Rob Piechulski**
Test Pilots	**Gaz Holland** **Kev Cross**