

# 3DZ

## IPS-powered 3D aerobat



### Specs:

Wingspan -	26"
Length -	22"
Wing area -	200 sq.in.
Wt -	<6oz (single motor)
Wing loading -	< 4.3oz/sq.ft.
Airfoil -	modified NACA 0015/20
Battery -	Kokam 3S1P 340mAh
ESC -	5A (e.g. GWS ICS-100)
Servos -	3 x Pico (e.g. GWS Pico, Hitec HS-55)
Rx -	4 channel micro (e.g. GWS Pico)

### Motor/prop options

1. GWS IPS DX-C with GWS 11x7HD
2. GWS IPS DX-A with APC 9x3.8SF
3. GWS IPSD-RXC-A with GWS 10x4.7SF



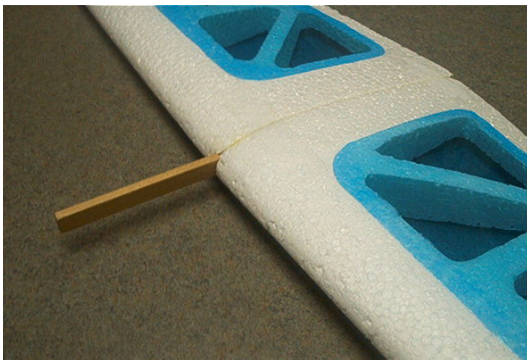
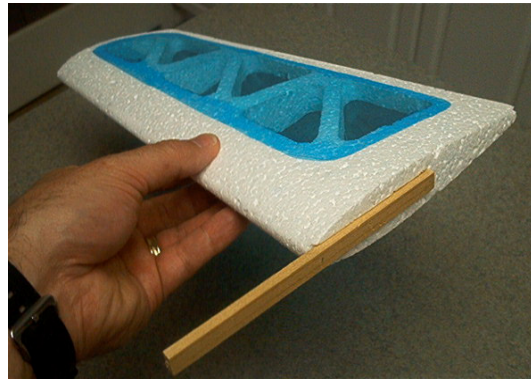
dV Flight Technologies

3DZ Assembly Instructions, © 09/30/04  
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### 3DZ Instructions:

Use foam-safe glue (UFO cyano, epoxy, polyurethane, PVA, white glue, etc) and, whatever you do, don't use more than what's absolutely necessary. Glue is heavy! Cover your building board with wax paper, read all the instructions first, yada yada yada....

1. Sand the leading edge of the wing halves round. The leading edge should be well rounded and quite blunt. Lightly sand any rough spots and remove "angel hair".
2. Take one of the wing halves and trial fit the root section into the fuselage cutout. Place the motor stick into the wing slot and try to pull the fuselage profile around the wing to meet the stick at the front. You will probably have to trim a little foam out of the fuselage to get a perfect fit. The fit is too tight to start with to ensure that you can trim it to a perfect fit. Try not to cut out too much but if the wing starts to fit a little loose don't sweat it, either. Later on you will install 'doubblers' in this area to reinforce the wing/fuselage joint.
3. Trim one end of the motor stick for an IPS drive. Glue the wing halves together with the motor stick sandwiched in between. It should extend 3" from the LE of the wing. I've used polyurethane glue and moistened the parts so the glue foams up and fills in around the stick and fills the pores of the foam. The downside is this takes about 24hrs to cure. If you use polyurethane glue you should tape the wing halves together firmly, as the glue will tend to force the wings apart as it expands. You could use epoxy for this step but you should use as little as you feel you can get away with to avoid adding too much weight.



4. Take a 26" length of 3/4" filament tape and cut it lengthwise so you get 2 x 3/8" strips. Clean any dust or debris from the wing and lay these tape strips down just ahead of the 'rib' cutouts on the top and bottom surfaces. These are the "spars".

5. You can cover the wing now or wait until construction is done. To minimize weight I just covered the open areas rather than wrapping the covering over the entire wing. I used Reynold's food wrap with glue stick around the perimeter of the wing. This added 3gm. Theoretically, you could shave off another gram by covering with Solite. If you do use Solite just make sure you use the lowest possible temp setting to avoid hurting the foam.

6. Insert the wing into the fuselage profile and tack glue into place with foam-safe cyano. The objective here is to glue these items together straight and perpendicular. When satisfied, lay in some more cyano wherever it's useful (when I glued mine I had some gaps in the joint that wouldn't fill, but that's OK because of the doublers)



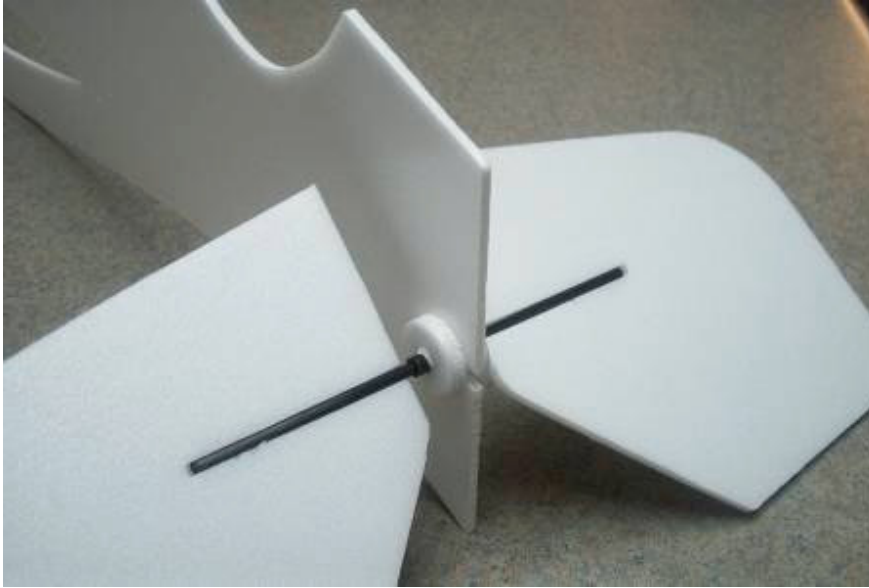
You may notice I forgot to install the fibertape! (OOPS!)  
I call this a learning experience...  
Actually, this model has survived MANY high-G flights without the tape, but I recommend you install it on your model.

7. Glue on the upper wing saddle doublers. These really help to stiffen up the joint between the solid wing and the flat plate fuselage, and they weigh almost nothing.

8. Take the two .050" carbon rods and tape one to each side of the fuselage. They should run from just over the wing saddle doublers to the rudder hinge line. If you line them up with the thrust line they look like trim lines. I used a foot of Scotch crystal clear 3/4" tape, held it straight, sticky side down, and picked up the carbon rod with it. Then I placed the rod on the fuselage and pressed it down in place. ( I laid the fuselage down on the edge of a table with the wing hanging over the side, and put a coffee cup on the "cockpit" to hold it in place).

9. Push the bearing tube through the hole in the fuselage near the rudder hinge line. Slide the bearing doublers onto the bearing tube and slide the axle into the bearing tube. Center the bearing tube in the fuselage and press the bearing doublers against the fuselage sides to secure the bearing tube. Use the axle to line up the bearing tube with the wing TE (roll axis) and to ensure the bearing is perpendicular to the fuselage in the yaw axis (looking down from above). When satisfied, wick cyano into the bearing doubler joints. Remove the axle. (If the axle fits a little loose in the bearing for your liking, you can wrap some Scotch tape around the axle. I found that a 1/2-turn of tape worked nicely to take up the slack.)

10. Lay out one stabilator and the axle flat on your building board and glue them together with foam-safe cyano. When the cyano is thoroughly cured, insert the axle into the bearing tube and mount the second stabilator. Line up the stabilators in the same plane. VERY CAREFULLY glue the second stabilator to the axle. DON'T get glue in the bearing! For added security you may want to press some clear tape over these glue joints to help prevent the stabilators from parting company with the axle. Strictly optional.



Here we see the foam bearing doublers installed on the bearing. Ignore the notch in the rudder hinge line. I was experimenting here.

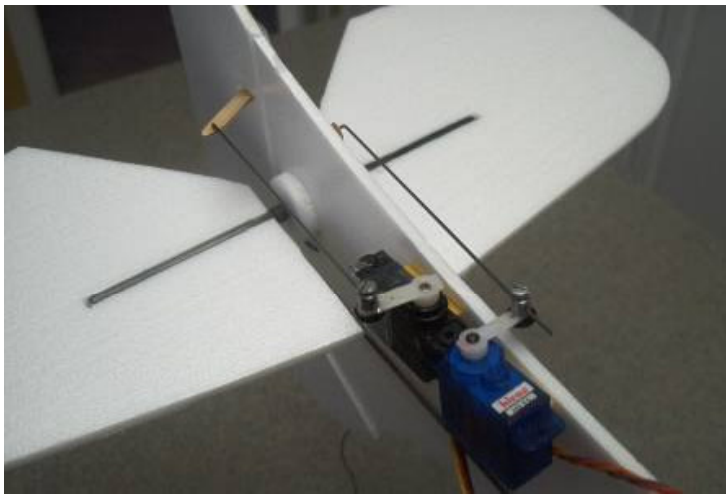
11. Cut a bevel into the leading edges of the rudder and ailerons and hinge these to the model. I used Scotch crystal clear tape. Mount the included plywood control horns.

12. Glue on the two “cowl cheeks” or "fuselage fairings". These are completely decorative and, since the stick is anchored in the wing, they aren't stressed at all. Just glue them to the motor stick and the wing leading edge.

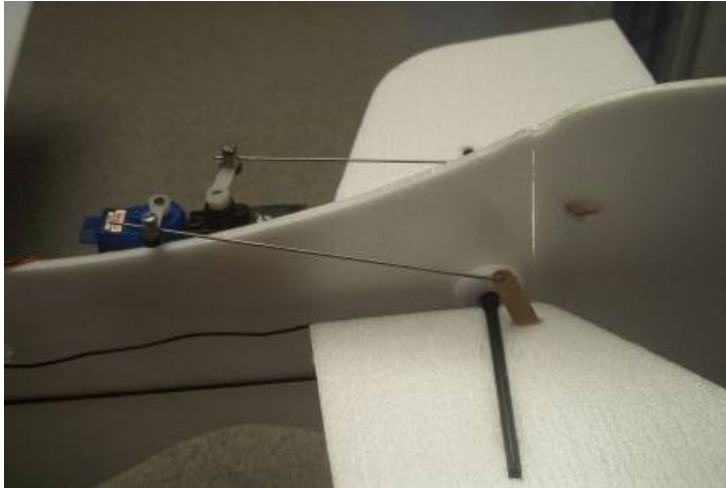
13. Cut out the foam around the motor stick if necessary to clear your motor. Cut out a hole in the wing root for the aileron servo. Make it a little small so the servo is a press fit. Cut a hole through the fuselage to clear the servo arm. Glue on the lower wing saddle doublers now and trim around the aileron servo installation.

14. Mount the motor. Plug in all electronics and lay out the servos, ESC, battery, and receiver on the fuselage to achieve proper balance. I found, with a dual motor, I had the Rx and tail servos well back on the fuselage to get a good CG. The aileron servo wires were short enough that they forced me to mount the Rx right under the aileron. I just cut a clearance notch out of the corner of the aileron to clear the Rx. The battery is just ahead of the CG. With a light CDRUM motor you may have to mount the battery on the fuselage ahead of the wing.

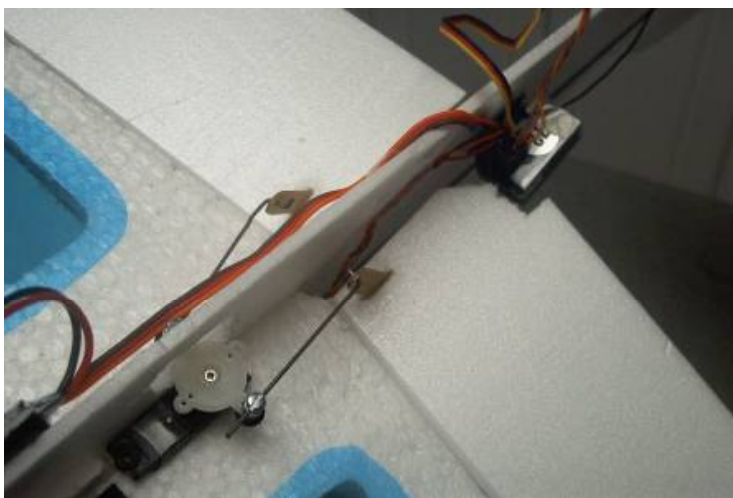
15. Fix the battery to the wing or fuselage with Velcro. The tail servos are stuck to the side of the fuselage with double-sided tape. The ESC and RX are fastened with Velcro. The elevator servo arm reaches across and underneath the fuselage to keep the elevator pushrod close to the fuselage, avoiding the stabilator path as much as possible.



These views show the tail servos in their most rearward positions, required for heavy dual-motor installations.



The rudder servo is just ahead of the stabilator.



Notice I've notched the aileron to clear the Rx. Aileron servo is press-fit into the wing.



Battery is fixed with Velcro under the wing. With lighter motors you may have to attach it ahead of the wing on the fuselage.

16. We're done! Oh yeah, you might want to decorate your machine with coloured markers, paint, or decals. Just make sure they are all compatible with foam. Don't add too many decals because they are heavy!

17. Flying! Charge up the battery, check your control throws and directions, throttle up and fly away (vertically, of course). If you're new to 3D, set your control throws on the mild side, especially the elevator, and set the CG at a more 'normal' location (3" from the root leading edge). Then, as you get comfortable, move the CG back and increase the rates.

18. Have fun!

Setup:

Throws:  $\pm 45^\circ$  on all surfaces, even more on the elevator.

Use 50% exponential on the elevator.

CG: 3-3/4" aft of the leading edge at the root.

Motor/prop combos tried, in order of satisfaction:

1. GWS IPSD-RXC-A (dual motor) with 3S1P Kokam 340mAh pack, GWS 10x4.7 SF prop. WOOHOO! Vertical climbouts at about 1/2-throttle. Draws 4A at the battery at full throttle.

2. GWS DX-A, with 3S1P Kokam 340mAh pack, APC 9x3.8 prop. Higher throttle setting needed to hover but definitely pulls out and up. Better duration. 2.2A at the battery at full throttle.

3. GWS DX-C, with 3S1P Kokam 340mAh pack, GWS 11x7 HD prop. Basically the same as the DX-A with the 9x3.8 prop.

4. GWS DX-A, with 3S1P Kokam 340mAh pack, GWS 9x4.7 SF prop. Higher throttle setting needed to hover. A little less hovering margin but probably better speed in flight. 2.2A at the battery at full throttle.

5. GWS DX-A, with 3S1P Kokam 340mAh pack, GWS 8x4.3 SF prop. Higher throttle setting needed to hover. Marginal hovering at an AUW of ~6oz. Better duration. 1.9A at the battery at full throttle.

Note on brushless motors: **WOW!**

This aircraft flies GREAT on CDROM conversions. The stock GoBrushless GB1.0 kit, for example, works very well with the 3S1P 340 Kokam and a 7x3.5 prop.

Anybody want to try an AXI?