Diablo

Instruction Manual

3D performance cannot be just copied to a smaller scale. Lots of aerodynamic details have to be considered, wing has to be enlarged, airfoils possibly to be changed, complexity has to be reduced since the smaller size won't require that much transportation gimmicks to break it down... Naturally wing loading gets higher, planes get faster, room for servos and engine gets more challenging. Now what if the smaller brother appears to be working even better than the big master? Well... then, a job has been truly well done. CARF-Models Diablo. The little brother of CARF-Models Mephisto.

CARF-MODELS

Liability Exclusions & Safety Responsibility

You have acquired a kit, which can be assembled into a fully working R/C model when fitted out with suitable accessories, as described in the instruction manual with the kit. However, as manufacturers, we at CARF-Models are not in a position to influence the way you build and operate your model, and we have no control over the methods you use to install, operate and maintain the radio control system components. For this reason we are obliged to deny all liability for loss, damage or costs which are incurred due to the incompetent or incorrect application and operation of our products, or which are connected with such operation in any way. Unless otherwise prescribed by binding law, the obligation of the CARF-Models company to pay compensation is excluded, regardless of the legal argument employed. This applies to personal injury, death, damage to buildings, loss of turnover and business, interruption of business or other direct and indirect consequent damages. In all circumstances our total liability is limited to the amount which you actually paid for this model.

BY OPERATING THIS MODEL YOU ASSUME FULL RESPONSIBILITY FOR YOUR ACTIONS!

It is important to understand that CARF-Models Ltd., is unable to monitor whether you follow the instructions contained in this instruction manual regarding the construction, operation and maintenance of the aircraft, nor whether you install and use the radio control system correctly. For this reason we at CARF-Models are unable to guarantee or provide a contractual agreement with any individual or company that the model you have made will function correctly and safely. You, as operator of the model, must rely upon your own expertise and judgement in acquiring and operating this model.

Personal safety

There are a couple of things that are good to keep in mind when you are assembling your CARF-Models Diablo. Some of them are common sense, but it doesn't hurt to be reminded. While you are working with tools and sharp implements, be aware of others around you and the environment you are working in. When cutting or sanding materials, always wear a face mask to avoid inhaling particles. Keep your work environment clean and tidy at all times. A clean workshop will enhance the experience. Protect all parts from scratches and dents. Use rubber matting on your bench, and be careful of components like screws getting between the part you are working on and the bench. BE CAREFUL with the two combined ultra torque servos, open pushrods, and bell cranks - there is imminent danger to break your fingers when you switch on the RC system.

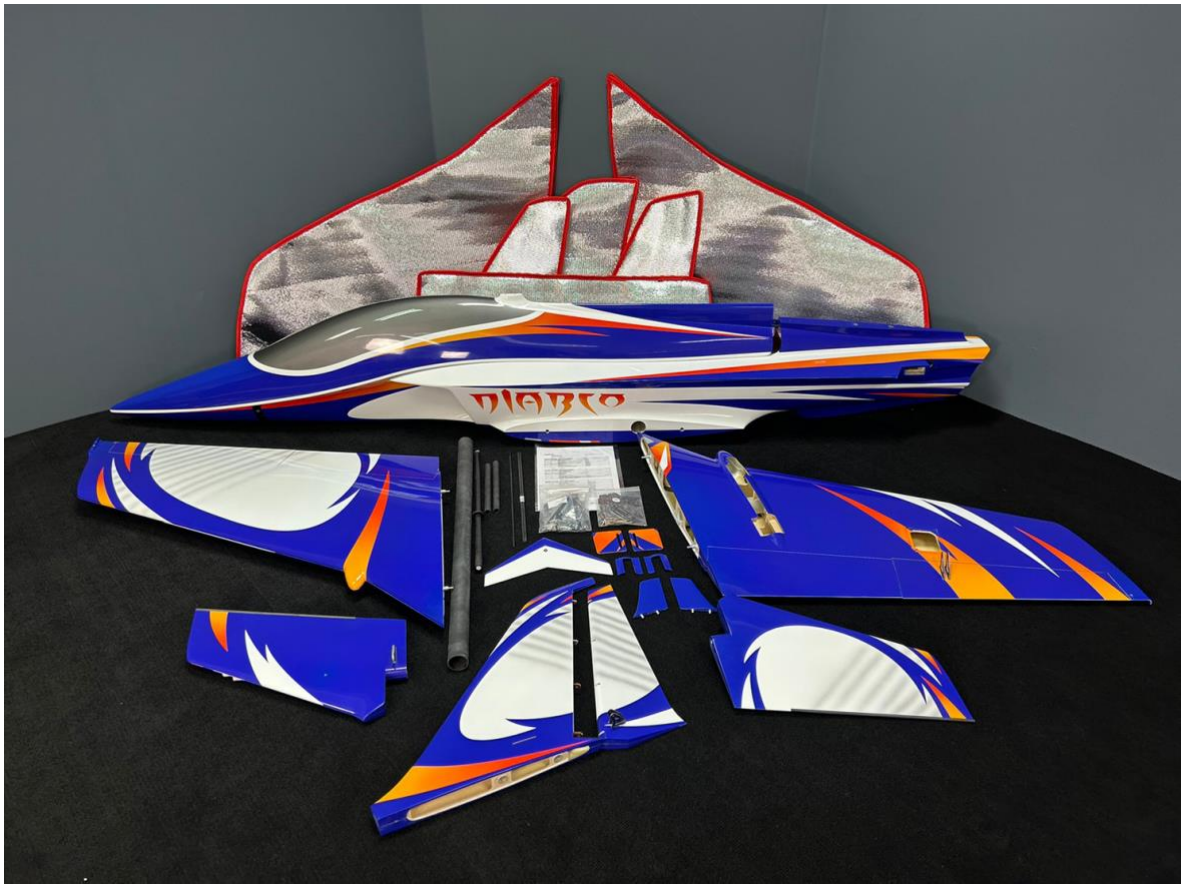
Assembly process

This manual is set to provide detailed pictures of the building steps. You may wish to change and do some things in a different order, which is fine provided you keep in mind that some things need to be done before some others. When planning out the installation of your components, always keep the centre of gravity location in mind. If you plan ahead you can avoid having to add weight to your model. It is far easier to remedy a nose heavy model than a tail heavy model. A few grams of lead at the rear is preferable to hundreds of grams in the nose! You will find that it is easiest to fit items that cannot be relocated, like aileron, elevator, rudder and throttle servos, before you do a preliminary C of G check. Receivers, ignition and batteries etc. can generally be relocated to suit your requirements.

Most of all, enjoy the process of creating your CARF Diablo, a job well done is always satisfying!

Diablo

Category – Sport Jets



About

This is a quick guide to the successful installation of RC and propulsion equipment into your new Diablo. We do not have a lengthy manual to bore you with how to tighten a bolt or how to clean a surface before gluing and such. We will provide within this manual the specific details of rigging this airplane successfully for many hundreds of hours of competition flying.

All the equipment we provide is thoroughly tested in this airplane. We did so many flights with the help of nameful pilots, powerful engines to proof if the power is enough and servos to make sure to recommend the best working equipment for you – and that's what we do with this manual now. PLEASE do yourself a favor and do not modify any of the design until you have a considerable amount of flights on the airplane and have a feel for WHY you might want to change this or that, if anything. Please give us the chance to show you that our research and development has been serious and successful and the sophisticated final setup we came up with works better than anything else we tried. We tried a lot!

We have seen a lot of equipment, hardware problems and failures during our testing. What you hold in your hands now is the result of all this hard work. Every detail has a reason. If it isn't exactly what you would have used, please give us the benefit of the doubt, and consider that we might have ALSO been trying to use something else instead which hasn't been working reliably or safely. We do not intend to save cost by providing a cheap solution in hardware and equipment. We are ONLY driven by our test results.

What do you need???

An expample of the basic and main accessories required…

This is list of required products to complete your Diablo KIT. This list only is a recommendation of what to equip your airplane with. There is no reason similar products from other brands cannot be used in this plane. There are many ways and products on the market you can use with the Diablo.

Amount	Required	Possible Accessories
1x	Engine	Kingtech K-210 / Jetcat P-220/250Pro
1x	Thrust Tube	CARF Models Vector Thrust Tube / Non Vector Thrust Tube
1x	Fuel Tank	CARF Models Fuel Tank 4L
1x	Landing Gear	Diablo Retract SET / Diablo Retract SET Black Edition
6x	Aileron, Rudder, Vector & Steering Servo	Mac Gregor MGB 6928HV V2
4x	Flap & Taileron Servo	Mac Gregor MGB8346HV
8x	Servo Arm short	CARF Servo Arm 25T 16-28mm
2x	Servo Arms long	CARF Servo Arm 25T 20-38mm
1x	UAT / Hopper	MAP High Flow Air Trap 6oz
1x	Gyro	Bavarian Demon Cortex Pro / Powerbox Igyro
1x	Power Supplie	Jeti Central Box CB210 or 220 / Powerbox Pioneer
2x	RX Batteries	Lipo 2s 2200 - 3000mAh
1x	Ignition Battery	Lipo / Life 3s 3000 - 4000mAh
-	Servo Wire	Powerbox Servo Wire Maxi
-	JR Connectors	JR Connectors

Build Description

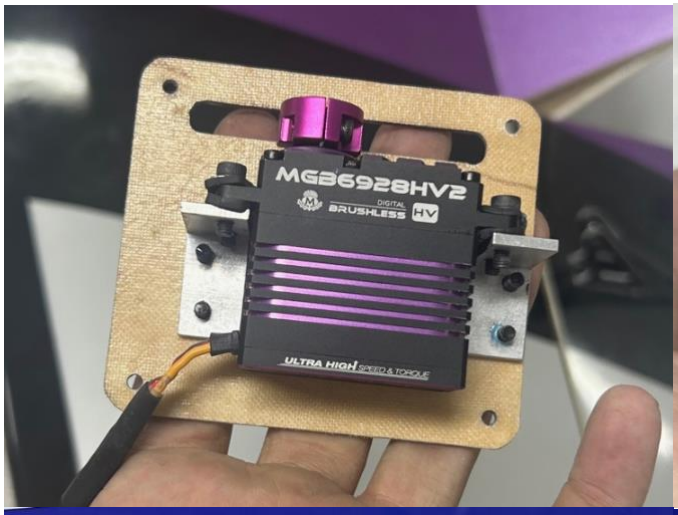
Wing Assembly

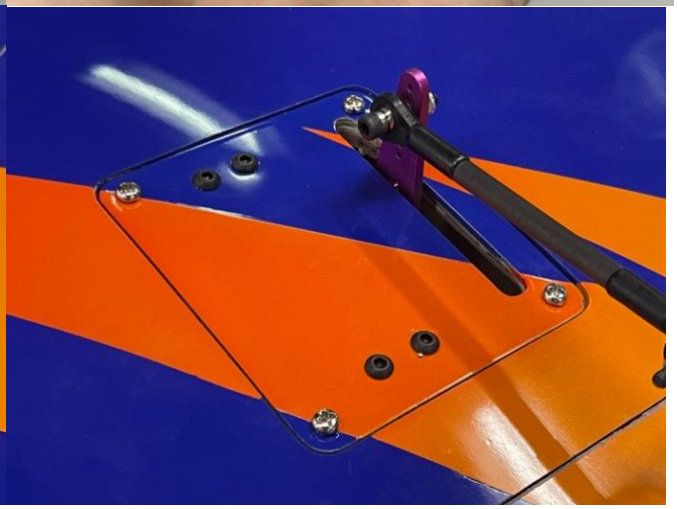
Servo Installation

Aileron Servo Installation:

- Prepare the servo arm to later hinge the linkage at 32mm length of the servo arm (best case you should drill a M3 thread into that hole)

- Allign the servo arm with the servo in the center of the servo arm slot to get the full travel deflection in both directions
- Install each of your two aileron servos to the servo hatch by using the aluminium angles and 8x M3 bolts
- Do not forget to use loctide after your servo is positioned
- Now you can put your extension wire through the wing to the servo slot, connect the servo wire, secure it with a safety clip or shrinking tube and put the servo hatch onto the wing
- Make sure your servo is connected to power to be centered and tape the aileron to the wing so it cannot move
- It's time to prepare your linkage to an approx. length of 120mm, using 2x M3 ball links, M3 thread and a carbon tube on top of the thread
- Install your linkage and mount the servo hatch to the wing using 4x allen metal screws 2.9x13mm
- Your aileron servo and linkage should be all assembled now and you can go on to the next step



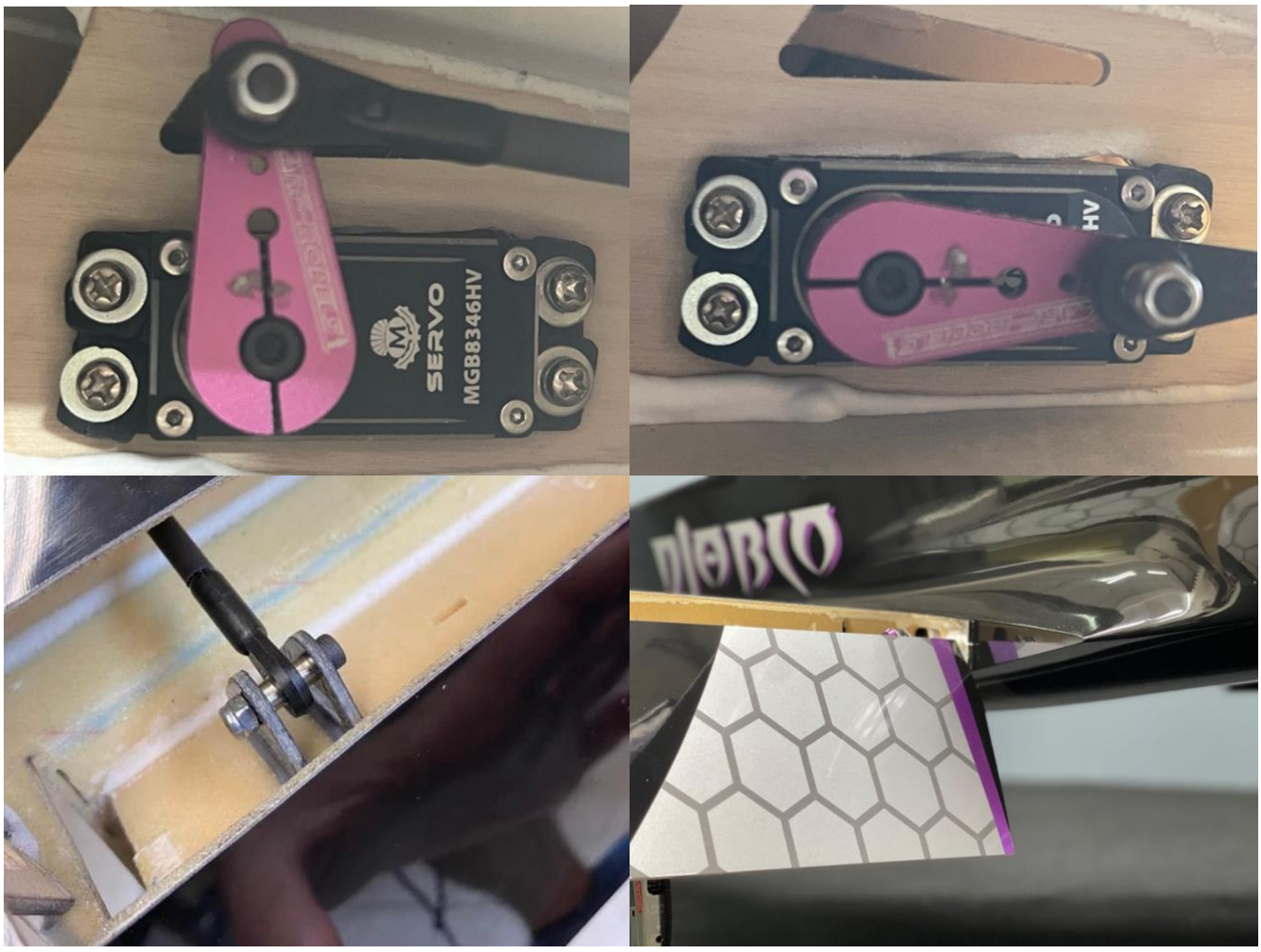
Flap Servo Rules:

At full deflection of the flap the servo arm needs to be in one line with the linkage to massivly reduce the load to the servo! Otherwise it could break your flap servo within a few flights…!

Flap Servo Installation:

- Prepare your servo and servo arm to be able to get the in pictures one and two shown servo travel (That's the only way to install the flap servo)
- Also prepare your servo to hinge the flap linkage at 23mm length of the servo arm **(**best case you should drill a M3 thread into that hole)
- Install your flap servo with the servo arm in the servo slot within the wing
- Assemble the flap linkage by using 2x ball links, M3 thread and a carbon tube on top of the thread
- Position your flap at a 100mm travel and fix it in this position

- Put your flap servo top full travel and adjust the flap linkage to perferctly fit the full flap deflection
- Adjust the “flaps up” and “flaps takeoff” positions within your transmitter
- After everything works the way it should retighten all screws and make sure everything installed the correct way



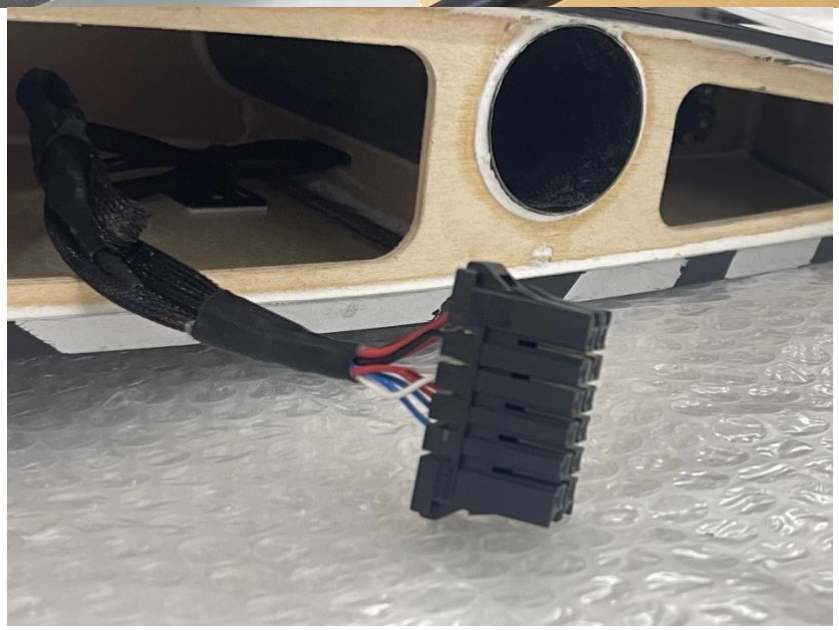
Main Gear Installation:

- The Diablo is designed to fit the electron ER-40 retract
- Before you start installing the gear please assemble the gear motors with the gear struts and wheels to perfectly fit the whole landing gear into the wing (no loctide yet)
- Position the landing gear in the landing gear slot in the wing and middle it within the slot to mark the mounting positions with a pen or marker
- After you marked the four mounting points please double check the position of the landing gear
- For now only mount the gear with two metal screws 3.4x21mm and keep going (use the other two screws after the landing gear is finished, in case youn have to change the position)
- Retract the gear manually with the electron gear controller to check if the gear retracts flawless or might hit the gear slot at some point (if so, you need to adjust the gear slot with a bit of sand paper)
- Next up you should install the the brake wire to the strut (use zip ties or shrinking tube) and drill a 4-5mm hole between two gear mount points to put the brake wire through
- Meanwhile you need to put the gear and brake wire through the wing
- Retract the landing gear one more time and check if the brake wire is not bending too much or is trapped between something

- If the gear works without any issues you now should add all metal screws to the gear and tighten all screws on the strut with loctide
- Now it’s time to install the landing gear cover (we recommend using clear tape, but you can use small screws as well)

Wing Connector:

- We recommend using connectors like the click connect/amp connectors or some others with minimum 10pins



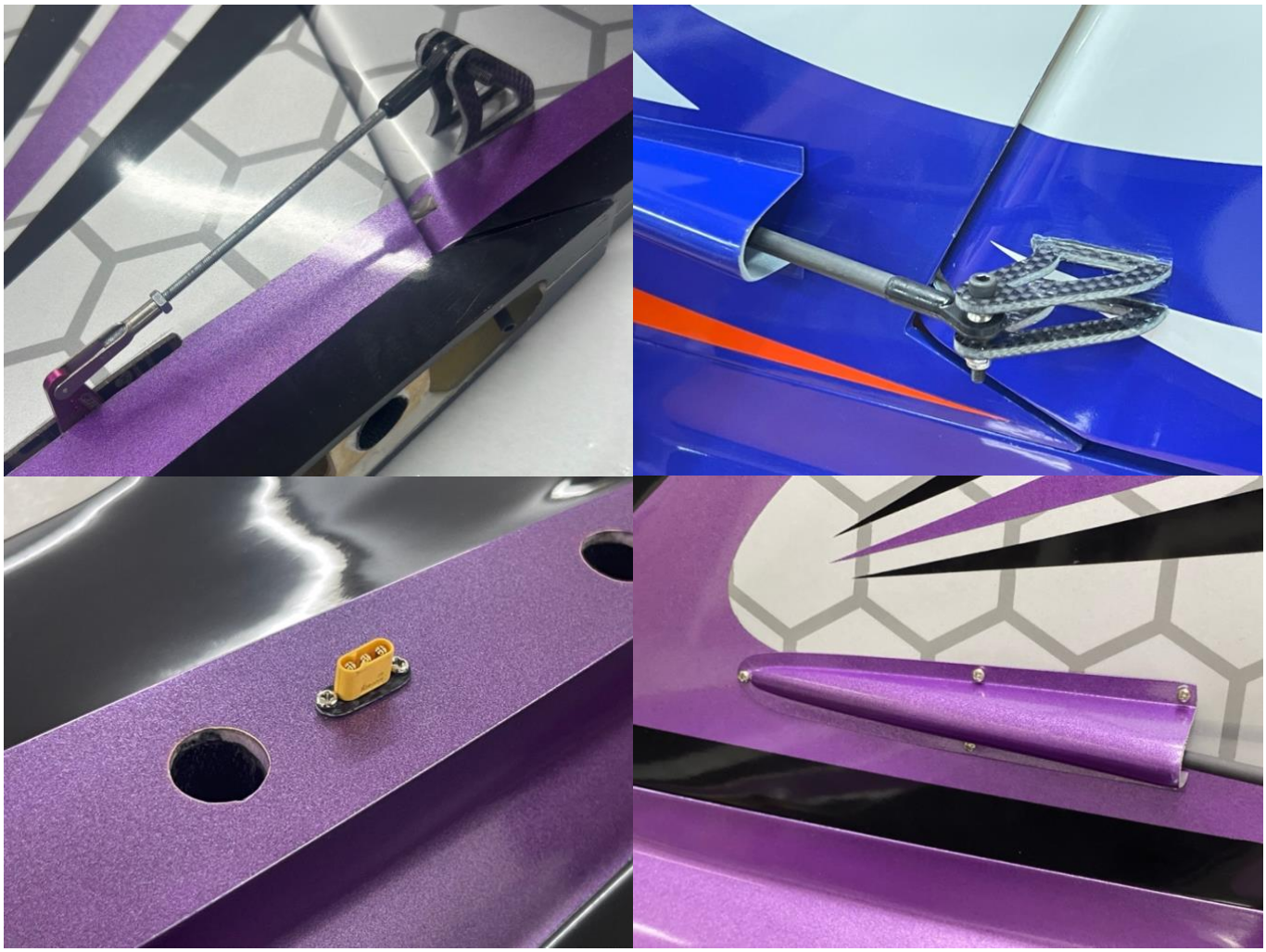
Fin

Rudder Servo Installation:

- Prepare your rudder servo with your servo arm to hinge the rudder linkage at 23mm length of the servo arm (best case you should drill a M3 thread into that hole)
- Install your rudder servo including the servo arm into the rudder servo slot and prepare the rudder linkage with 1x M3 ball link, 1x aluminium clevis and M3 thread

- Center your rudder with some tape and connect the rudder servo to power to keep it in the center
- Now adjust your rudder linkage and add the carbon tube if done
- Retighten the servo screws as well as the linkage screws and check if the rudder is moving flawless
- At last add the linkage cover with three small metal screws, one the front (left on picture 4) and one on each side on the back (right on picture 4)

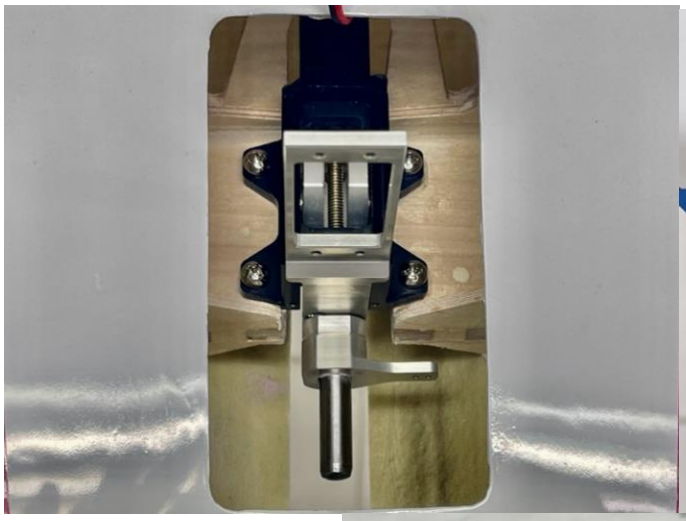
- As a connection between the rudder and the fuselage you can use the normal JR plug or the yellow MR30 connector



Fuselage

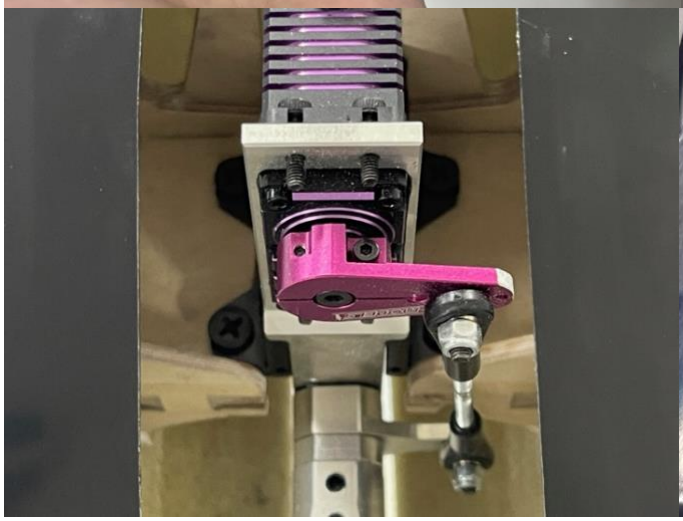
Nose Gear Installation:

- Before installing your nose gear you need to assemble the gear motor with the strut and the wheel (no loctide yet)
- Position and center the nose gear on the gear mount and mark the mounting points with a pen or marker
- To adjust the position you should install only one screw first, readjust by installing the canopy and after the position is still good add the other screws
- Make sure the landing gear retracts without damaging the gear slot
- If that’s the case you now can retighten the struts screws with loctide



Nose Gear Servo Installation:

- To install your nose gear servo you should prepare your servo arm
- Also prepare the servo arm to hinge the linkage between 15–18mm length of the servo arm
- Assemble the nose gear servo linkage to the correct length and install it either before or after the nose gear installation (do not crossover the linkage from the servo to the nose gear arm)
- Make sure the servo arm and the nose gear arm both are parallel to each other

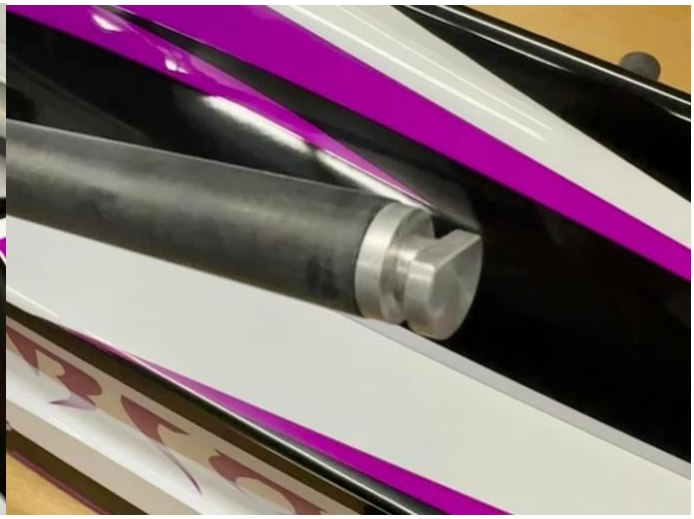




Taileron Servo Installation:

- Before installing the taileron servo you should prepare the servo arm to hinge the linkage at 26mm of the servo arm
- Move the servo arm so it's in line with the servo to install it into the taileron servo slot and moutn it with 4x allen screws
- Next up center the taileron servo by connectimng it to power and fix the tailerons in place by using some tape
- Now assemble the taileron linkages and adjust them between the servo arm and taileron arm
- If the linkages are at the correct lenght (approx. …) you can finish the installation of the taileron linkages and mount them with M3 bolts, M3 washers and stop nuts on the servo's side and M4 clevis on the taileron arm

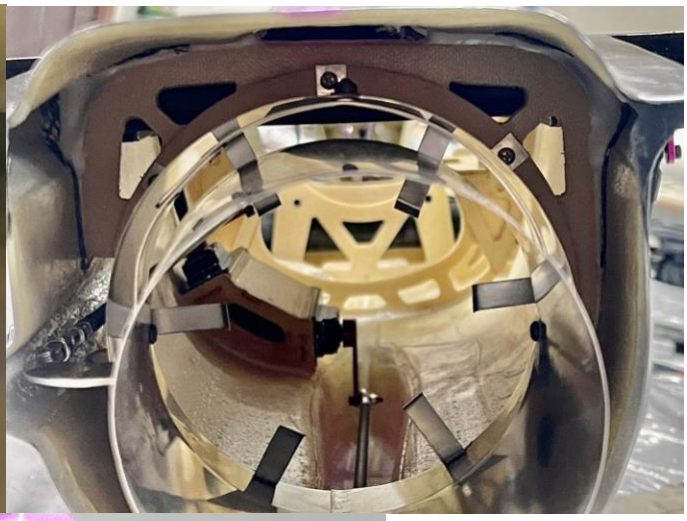
Taileron Installation:

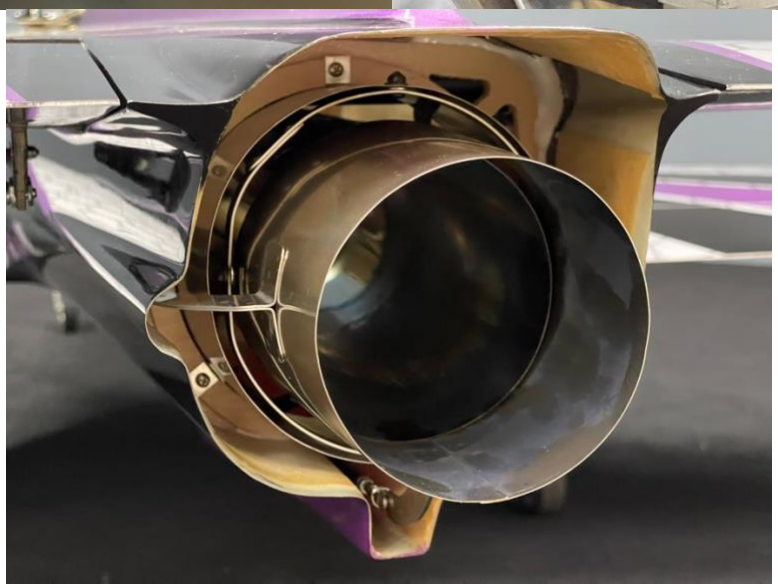
- The tailerons need to be installed by turning them 90 degrees against each other
- Only in this case you can remove or assemble them to the fuselage

Vector Unit Installation:

- The thrust vector unit should be mounted to the very last wood rib ring in the fuselage
- Just allign the mounting points of the vector unit along the ring and ensure the vector arms for the linkages are in the correct position in front of the cutouts in the wood rib
- To mount the unit you should use 5x allen screws





Vector Servo Installation:

All these steps should be done before installing the thrust tube!

- Prepare your vector servos with your servo arm to hinge the linkage at the 38mm hole of the servo arm
- Now you can install the vector servos to the carbon servo plates using 8x M3 bolts, 8x M3 washers and 8x M3 stop nuts (picture 1)
- You can keep going by mounting the vector servos into the fuselage using 4x M4 bolts and 4x M4 washers (picture 2 & 3)
- Assemble your vector linkages with the included M3 thread, M3 ball links plastic (aluminium not included), M3 clevis and a carbon tube on top

This steps can only be completed after the vector unit has been mounted!

- Center your vector servos by using a servo tester and adjust the linkages so the thrust vector unit is centered within both directions
- Finish the installation of your vector linkages by mounting them with 2x M3 bolts, 2x M3 washers and 2x M3 stop nuts on the servo's side and hinge the 2x M3 clevis to the vector unit
- Make sure you secure the clevis with a zip tie or safety wire (from opening / getting lose)

Thrust Tube / Turbine Installation

Thrust Tube Installation:

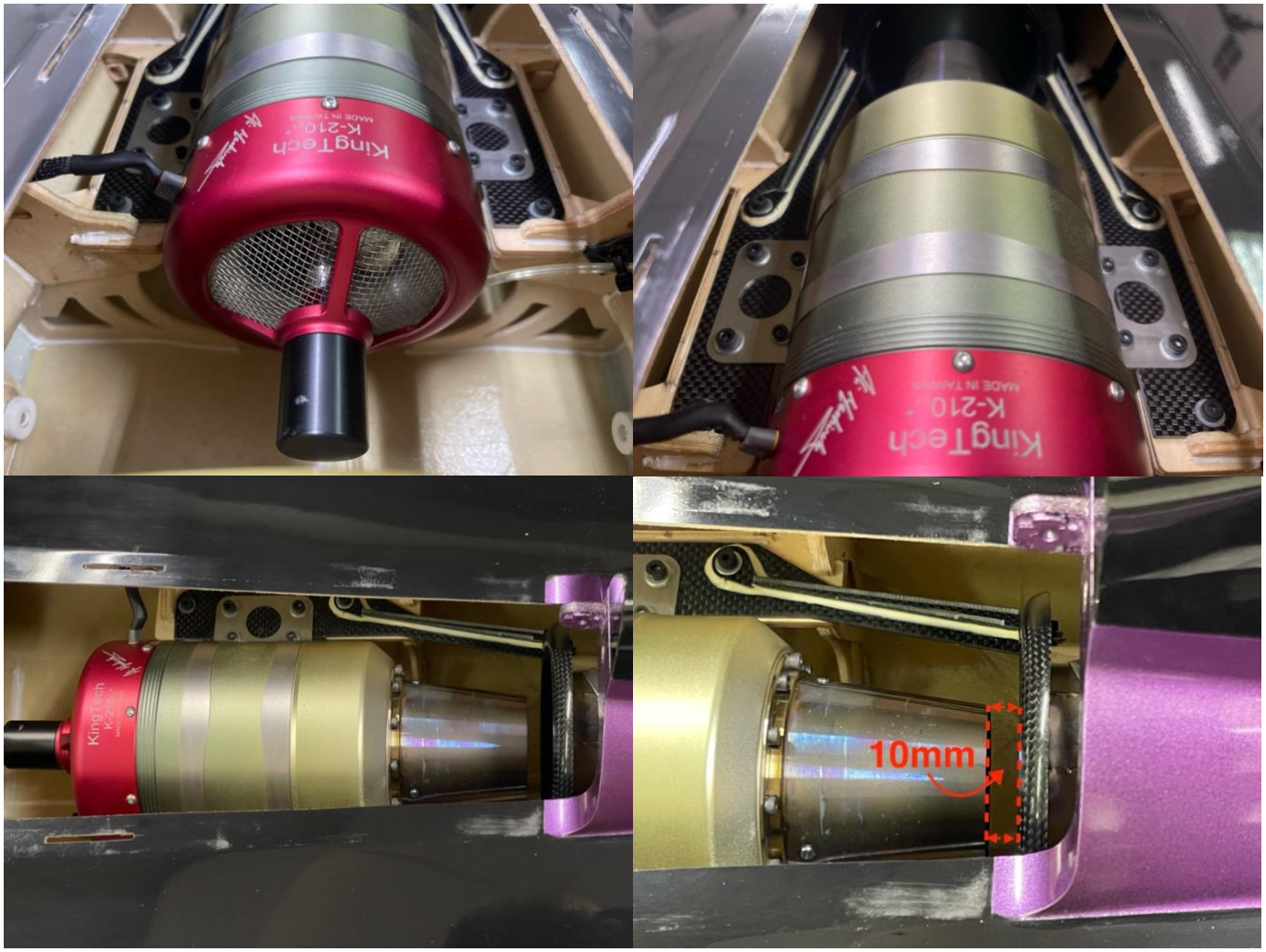
- Before installing anything you need to assemble the thrust tube (it's very easy)
- Just connect the thrust tube with each of the two mounting plates and secure each of them with a stop nut
- Now you should install the whole thrust tube assembly into the fuselage

Attention!!! Make sure the rear end of your thrust tube reaches at least 30mm into the thrust vector unit! If not the rear edge of the thrust tube will interfere with the screwheads of the vector gimbel and this will cause a crash!

Turbine Installation:

- Place some tape on the carbon mounting surface between the mounting point and place your turbine on top of it
- Take a good 10mm thick wood piece or something similar and place it between the turbine and the thrust tube intake to get a perfect distance of 10mm between them
- At the same time ensure that your turbine is middled within the thrust tube (check by watching from the back)
- After the turbine is centered you should mark the turbine mounting points with a pen or marker and remove the turbine as well as the thrust tube assembly
- Now you can drill the holes for your turbine mount into the carbon mounts (two holes each) and glue 4x t-nuts from the back (reversed)
- That way you can have access to your turbine during all time (example: removing it for service)

- Mount the turbine to the carbon plates with 4x bolts (K-210 uses M4 bolts)
- The final step is to reinstall the thrust tube assembly (4x M4 bolts) including the turbine back into the fuselage, connect the ECU wire and the fuel line



Fuel Tank / UAT Installation & more

Fuel Tank Plumping:

- Prepare the fuel tank plumping like showen in the picture
- The aluminium fuel pendulum can also be changed to a felt clunk, but both will work (we recommend to use a felt pendulum just in case you got a small airbubble in your uat the felt pendulum will still be wet of fuel)
- Don’t forget to secure all connections with safety wire before installing the pick up line into the fuel tank

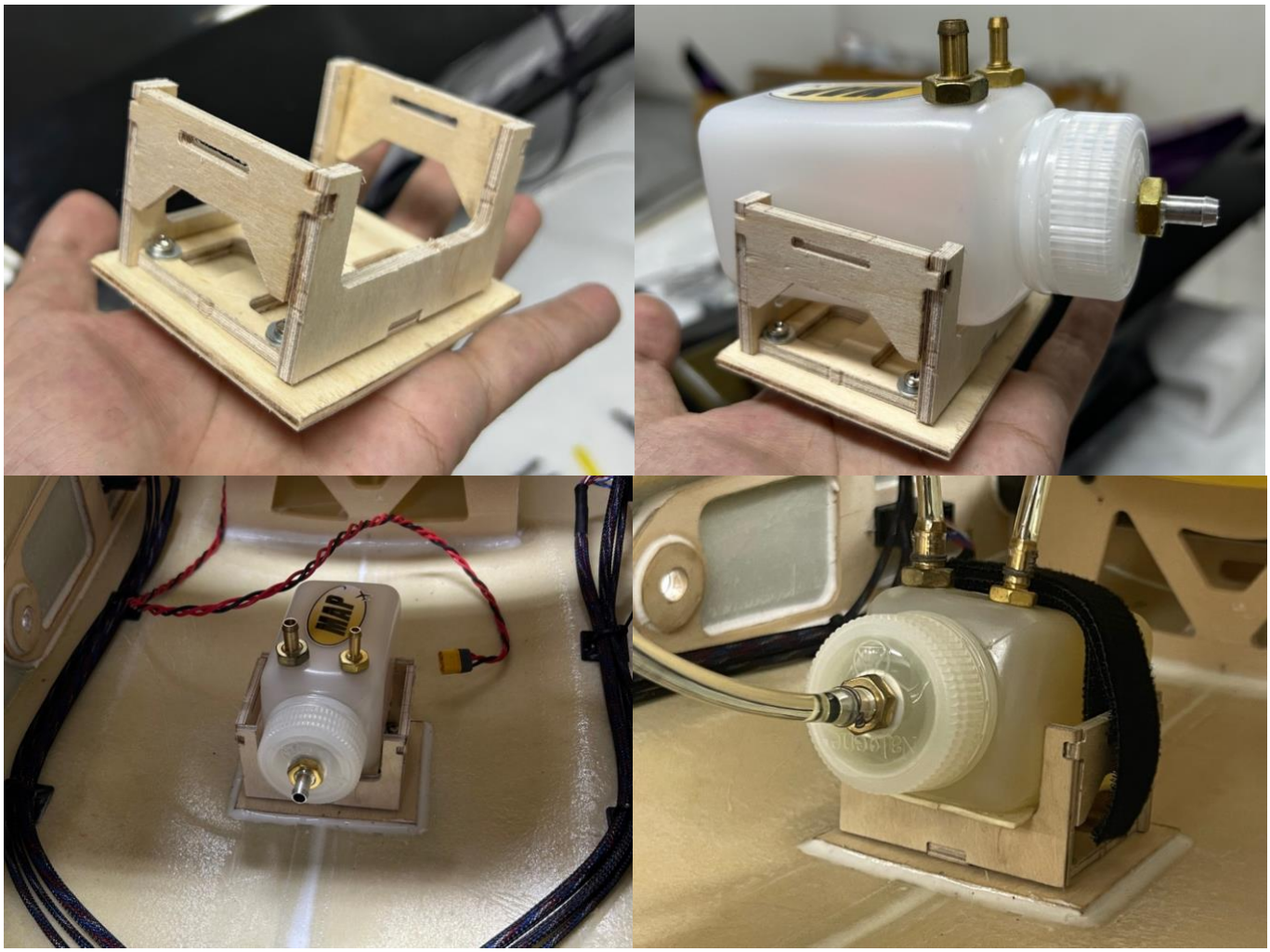
Fuel Tank Installation:

- First you should preassemble the fuel tank tray with some resin like shown in picture 1 (4x milled wood parts & 2x carbon tubes)
- After you completed this step you should place the fuel tank tray directly next to the wing tube (picture 2)
- To fix the tray in place use some resin with micro ballon, a small stripe of fiberglass and let everything cure
- Now add some double sided tape on top of the fuel tank tray to prevent the fuel tank from sliding to any direction
- Put in the fuel tank from the top and precisely place it onto the double sided tape (picture 3)
- At last add the velcro all around the fuel tank including around the carbon tubes to really secure the fuel tank from moving (picture 4)

UAT / Hopper Installation:

- There are few ways to mount your uat/hopper tank, but you somehow have to create a mount for it which brings up the front of the uat a little (this makes airbubbles leaving the uat way better)
- This mount for the MAP UAT 6oz is an example of how to mount your uat into any plane like the diablo
- The is designed to be a two parts mount, the bottom side will be glued to the bottom of the fuselage at approx 15–25cm in front of the main fuel tank
- The upper part of the uat mount will be screwed to the already installed lower part of the mount
- Then the uat can be installed the same way as the main fuel tank
- Some double sided tape and velcro to secure the uat from sliding or moving

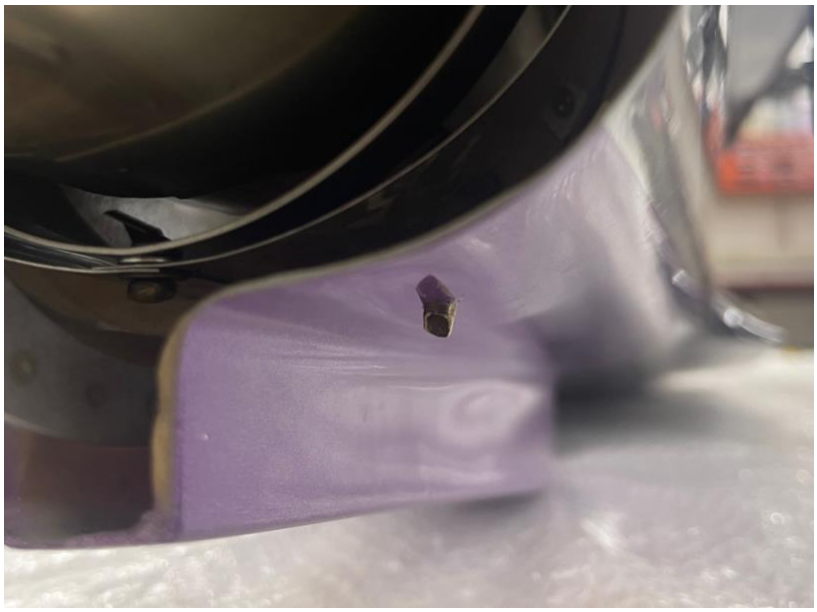
- Don’t forget to secure all fuel lines, you don’t want a fuel line come off…



Overflow Installation:

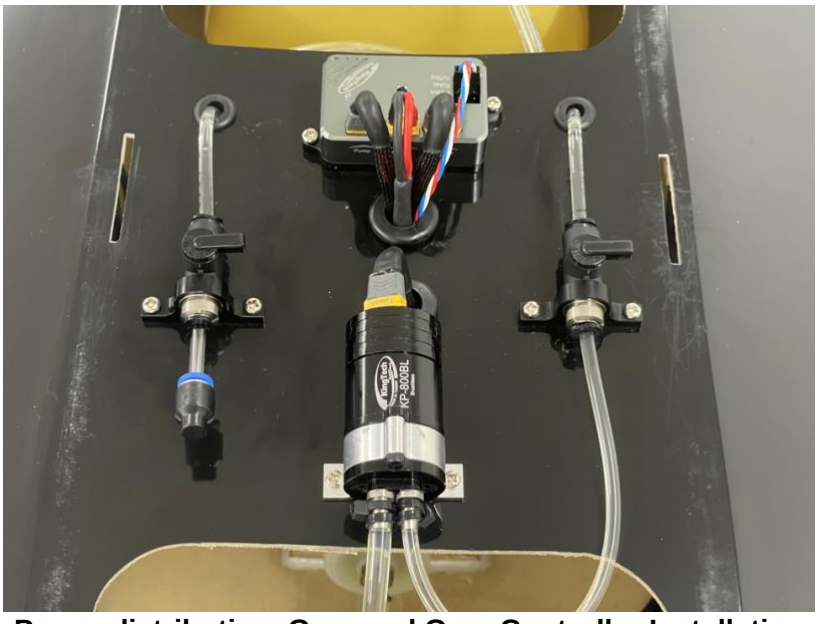
- We recommend to install your overflow outlet edge as far in the back of the plane as possible in the area below the vector unit

- You should not keep your outlet in line with the fuselage surface, in that case your fuel would run along the rear fuselage (keep it further out – approx 5mm is enough)



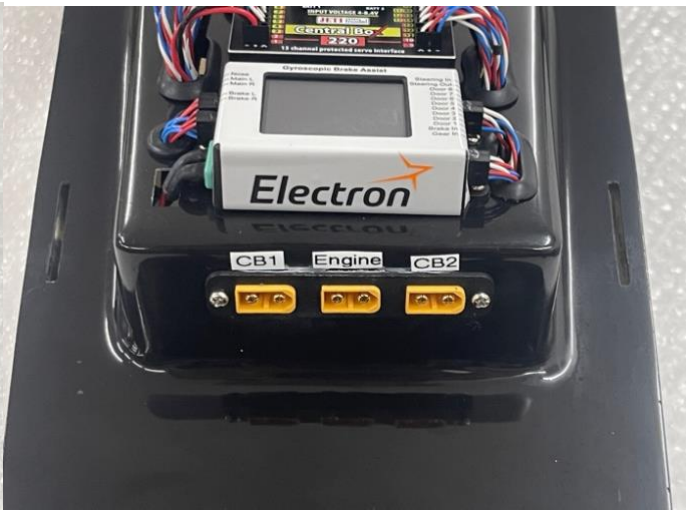
ECU, Pump & Valve Installation

- We recommend this area to install the fuel pump with the nessesary fuel valves
- The turbine electronic ECU should be installed in this area as well
- This layout is a good working example of how it should look like but you should feel free to use a different layout
- Just don't forget to put some wood pieces below the mounting points of these items



Power distribution, Gyro and Gear Controller Installation

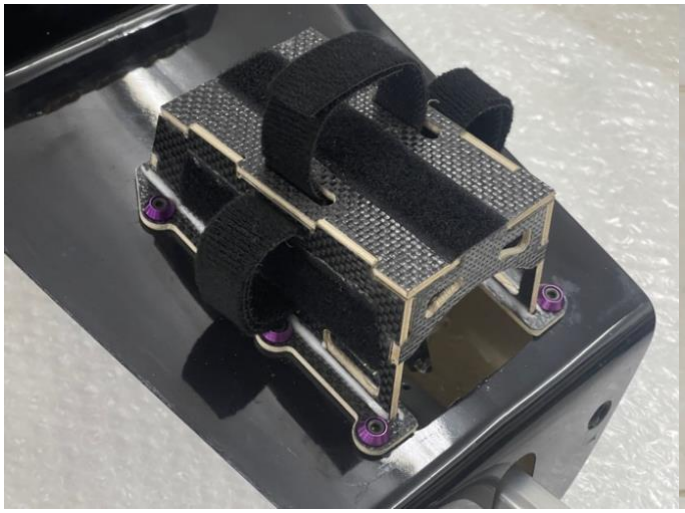
- Here we have an example of how the rc board should look like
- At this area we recommend to install the gear controller, power supply and the gyro
- The battery ports can be positioned right below the rc board to be in perfect distance with the battery tray

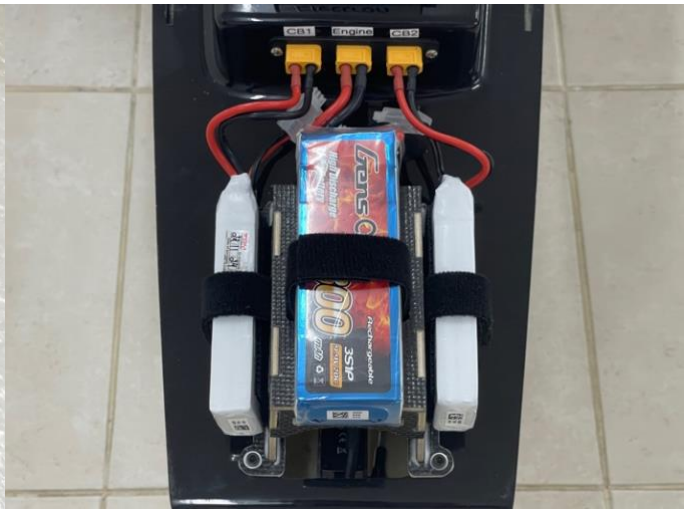


Center of Gravity & Batteries

- **The center of gravity is at 395mm – 405mm behind the rootrip leading edge tip**

- The turbine/ecu battery will be placed on top of the battery tray at the front of the fuselage
- The two rx-batteries should be placed on the left & right side of the battery tray at the front of the fuselage
- All of them should be attached **and** secured with welcro





Final Settings

Control Throws:

Vector flying is a very special feature, that's why it requires a certain level of concentration. Mistakes can happen really fast… We would like to recommend a few basic parameters of how to set up your Diablo which doesn't mean you must use exactly this set up. For sure you can change the rates, the expo amounts or the Gyro gain to match your feeling and flying style. But. Beware of changing to much or even to many parameters at the same time. Small mistakes can have a bad ending.

Here is a list summarizing the surfaces rate values (mm) as well as the expo amount and some other infos:

We recommend to use 3 Flight Modes:

Normal Flight Mode: Used for Take Off, Landing and all normal aerobatic flying.

Vertical Spin Mode (3D-Mode One): Used only for vertical Spins (Flying vertical with some speed, switch on to this mode and wait until your plane slows down, now you do a few spins along the rudder vector and bring the nose back down).

3D Flight Mode (3D-Mode Two): Used for hovering, flat spins and all other 3D manoeuvers.

	Normal Flight Mode	**Vertical Spin Mode**	**3D Flight Mode**
	Rate (Expo)	Rate (Expo)	Rate (Expo)
Aileron	20mm up/18mm down (50% Expo)	20mm up/18mm down (50% Expo)	30mm up/25mm down (70% Expo)
Elevator	55mm up/45mm down (65% Expo)	35mm up/30mm down (50% Expo)	60mm up/60mm down (65% Expo)
Rudder	55mmm (45% Expo)	70mm (65% Expo)	65mm (55% Expo)
Vector Elevator	Off	Off	On - max. Rate (55% Expo)
Vector Rudder	Off	On – max. Rate (55% Expo)	On - max. Rate (55% Expo)
Taileron Mix (Aileron)	Off	Off	40mm up/35mm down
Flaps Take Off Flaps Landing	30mm 120mm		
Elevator Mix (At Full Flaps)	7mm		
Steering	100% Servo Travel / 65–80% Expo		

	Gyro Gain	Gyro Gain	Gyro Gain
Cortex Pro Gyro	45%	85%	75%
Other Gyro's	35 - 50%	70-90%	60 - 80%
GS-200 Gyro	20%		

Cortex Pro SETUP:

	Bank 1 (Quer/Aileron)	**Bank 1 (Höhe/Elevator)**	**Bank 1 (Seite/Rudder)**	**Bank 2**
Gain	4	8	4	Off
Stick Priority	15	16	18	Off
Lock In	6	6	5	Off

The center of gravity is at 395mm – 405mm behind the rootrip leading edge tip

Thank you for being a loyal customer, for choosing a fine and technologically very sophisticated aircraft over many other, maybe simpler built choices on the market. We are sure you will enjoy every minute of building and flying your Game Changer and taking the Diablo to its limits.

We hope you have enjoyed assembling your CARF-Models Diablo and you have many years of happy flying with it. If you have found yourself in difficulty and need some assistance, your sales rep is only an email away. Please contact your rep and they will endeavour to assist you, and get you back on track. Alternatively you can contact us via the emails below. We also welcome your feedback, please contact us if you would like to see something added or altered. We are always looking to improve our products and the information we supply.

www.carf-models.com

Diablo Manual (February 2025)

Hardware KIT Components Diablo

Part	Product	Quantity	Used for Part:
Fuselage			
	Sheet metal Screw 3.4 x 21 mm	4	Gear
	Allen Screw M3 x 10	6	Battery Tray
	T-Nut M3	6	Battery Tray
	Washer D3	6	Battery Tray
	Velcro 250mm	3	Battery Tray
	Allen Screw M4 x 10 mm	4	Turbine
	Allen Screw M4 x 12 mm	4	Turbine
	Stop Nut M4	4	Turbine
	Washer D4	8	Turbine
	Allen Screw sheet metal black 3x14	6	Vector
	Clevis spring steel M3	2	Vector
	Stop Nut M3	2	Vector
	All Thread M3 x 50mm	4	Vector
	Plastic ball link M3	2	Vector
	Nut M3	2	Vector
	Allen Screw M3 x16 mm	2	Vector
	Carbon Tube ID3 x OD5 x 400mm	2	Vector
	Allen Screw M3 x 16mm	10	Vector
	Stop Nut M3	10	Vector
	Washer D3	10	Vector
	Allen Screw M4 x 10mm	4	Vector
	Washer D4	4	Vector
	Counter Sunk M4 x 25mm	1	Canopy

	Allen Screw M4 x 12mm	1	Canopy
	Plastic ball link M3	2	Nosegear Linkage
	Stop Nut M3	1	Nosegear Linkage
	Allen Screw M3 x 16mm	1	Nosegear Linkage
	Washer D3	1	Nosegear Linkage
	Allen Screw M3 x 12 mm	1	Nosegear Linkage
Wings L/R			
	Knurled Plastic Nut M6	4	Gear
	Sheet metal Screw 3.4 x 21 mm	8	Gear
	Stop Nut M3	8	Aileron Flap
	Allen Screw M3 x 16 mm	8	Aileron Flap
	Button Head Screw M3 x 8 mm	8	Aileron
	Allen Screw M3 x 10 mm	8	Aileron Flap
	Washer D3	8	Aileron Flap
	Allen Screw sheet Metal black 3x16	8	Servo Flap
	Washer D3	8	Aileron Flap
	Aluminum Angle (Same Flash on Elevator)	4	Aileron
	Plastic ball link M3	8	Aileron Flap
	All Thread M3 x 35mm	2	Aileron Flap
	Carbon Tube ID3 x OD5 x 15mm	2	Aileron Flap
	All Thread M3 x 65mm	2	Aileron Flap
	Sheet metal Screw 2.9 x 13 mm	8	Servo Hatch
	Carbon Tube ID3 x OD5 x 45mm	4	Aileron Flap
Elevator			
	Allen bolt M3 x 14 mm	2	Servo
	M3 Stop Nut	2	Servo
	Allen Screw sheet Metal black 3x16	8	Servo
	Washer D3	8	Servo
	Aluminum clevis M4 with Pin and Clip	2	Elevator
	Ball link M4	2	Elevator
	Nut M4	2	Elevator
	All Thread M4 x 50mm	2	Elevator
	Carbon Tube ID4 OD6 x 35mm	2	Elevator
Rudder			
	Allen Screw M3 x16	1	
	Allen Screw M4 x16	1	
	Stop Nut M3	1	
	Plastic Ball Link M3	1	
	Clevis spring steel M3	1	
	Nut M3	1	
	All Thread M3 x 120mm	1	
	Washer D3	4	Servo
	Carbon Tube ID3 OD5 x 100mm	1	
	Allen Screw sheet metal black 3x16	4	Servo