PLEASE READ THIS FIRST

Many thanks for selecting the 2025 Wabbit!

This newest version of the Wabbit adds electronics accessibility to allow easy installation and servicing of the electronic components.

Please follow the steps in the following pages to ensure that your Wabbit is set up optimally

To ensure a great maiden flight, there are several things we really want to emphasize before you begin assembling the model, and before your first launch.

(a) ***NAIL THE CENTER OF GRAVITY!!!*** *Wings of this type are very CG sensitive. Please follow the recommended CG placement and "Fine Tuning" procedure carefully… you will be glad you did!*

(b) ***DO NOT EXCEED THE RECOMMENDED ELEVATOR THROWS.*** *One other aspect of planks, or pseudo plank-style plan forms, is that they need very little up / down elevator. Use the Dual Rates and/or End-Point Adjustments on your transmitter to dial-down your elevator to the recommended throws. If you exceed them, hyper-stalling, a feeling of sluggishness (meaning only the plane, but who knows?), and short flights are almost guaranteed.*

As with most NCFM gliders, the ***Wabbit*** *is intended for medium to heavy air. It should maintain in lighter lift, depending on how clean the airframe is, but it is happiest in beefier conditions.*

We are always learning, modifying, adjusting and improving our aircraft. Consequently, we continually update our website with the latest findings. The "Latest News" and FAQ sections can be checked for reference.

THANKS!!

☺

2025 Wabbit

High Performance Sloper

For when you want to annoy the competition!

Wing Span: 24” • 160 Area: Sq.In. • Typical Minimum Weight: 7 Oz.

Note: For the very latest info on any CG or building updates,
please check the “Latest News” section on our website.

www.northcountyflyingmachines.com

(858) 858-775-0505

~ N C F M ~

ASSEMBLY INSTRUCTIONS:

First Draft 3.18. 2025

Package Includes:

1. *One fully built and covered Wabbit (No electronics included)*
2. *One fully covered balsa fin.*
3. *One set of control rods*
4. *One set of control horns*
5. *One 1.5mm Hex key wrench*

Also Needed:

(but not included)
A small roll of masking tape
A piece of string that's about 12" long.
A small piece of lead. (How small? You'll find out!)

Electronics required:

(but not included)
Two micro servos
One receiver battery pack
One R/C micro receiver

On page 15 of this manual you can find the specification for the electronics and the space provided in the Wabbit. for each.
On Page 16 you can find a full-size illustration of the electronics compartment.

Please use the full-size illustration of the Electronics Compartments layout on page 15 as a guide when sourcing the receiver, servos and battery pack.

Before you start: *You should read this User Manual from beginning to end. It is meant to give you an idea of what the Wabbit is all about. Following the steps in the following pages will help you setup your Wabbit without a lot of back and forth and trial and error. Of course, if you think you can do a good job without using the information and tips in these instructions, by all means go ahead!*

After reading the instructions that follow, and assuming you have sourced the proper electronics and are ready to give the setup a go, take the Wabbit out or its wrapping and take a close look at it to make sure it is in good shape. If it's not, return it to us before anything else. We can't reimburse you for the shipping, but we will do our best to replace it with one that is in good shape.

Now …. what is "Good Shape"?

The Wabbit is made of EPP foam, some balsa wood and a few 3D printed parts. The EPP foam is covered with heat shrink covering that was tight as a drum when it left our shop. The covering might have developed wrinkles while in transit, but the wing should not be warped, dinged or scratched. The wrinkles are pretty much unavoidable in a foamie and don't affect flight that much if you don't let them grow. Use an iron to remove the wrinkles but be careful not to warp the wing!

So if the Wabbit is in good shape, your next step would be to set up your Wabbit.

This manual describes the Wabbit set up along the following general steps:

- ***Set up the R/C system outside the Wabbit***
- ***Temporarily install the electronics inside the Wabbit to check on their proper operation.***
- ***Permanently secure the electronics inside the Wabbit***
- ***Finish installing the Control rods, horns and fin.***
- ***Balance the Wabbit***
- ***Go fly!***

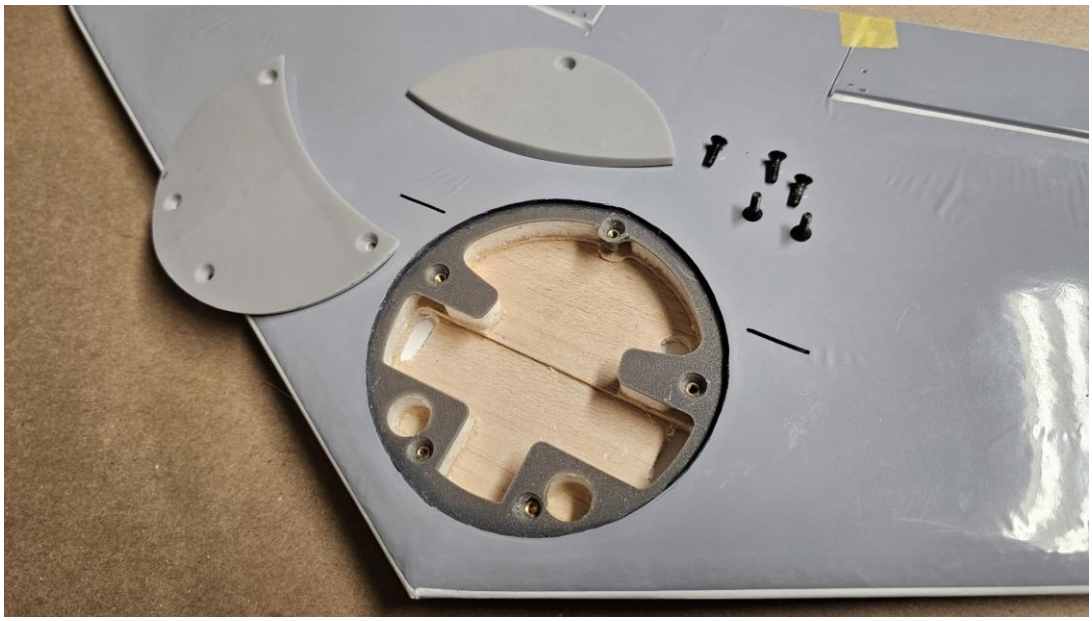
During this process you will open and close the hatches and insert and remove the servos several times.

Installing the Electronics:
Turn the Wabbit over and look at its belly. You will see two hatch covers:

*The **front hatch** is secured with four screws … This hatch is covering the servo and battery compartment. It is meant to be accessed during initial installation of the servos and battery and when service is required. It's a good idea to not open the front hatch unless service is required. This ensures that the items inside will not shift and alter the CG.*

*The **rear hatch** is secured with one screw….. This one is covering the receiver compartment. It is meant to be accessed easily if a switch is not installed and the receiver needs to be connected to the battery manually every time you want to power it up or down.*

Start by undoing all five screws and removing both hatches.
Now you can see the interior of the Wabbit (see the last page of this manual for a full-size illustration of the compartments and their contents).



Before starting the installation of the servos and battery, install the servo arms, connect the servos to the receiver and test their operation*.*
At the end of your testing, you need the servo arms to be in their proper position before they are installed inside their compartment.
After the servos are permanently installed, it will not be easy to adjust the servo arms.

Set up the transmitter with a "Delta" program to control the elevons.
This manual assumes that you know how to set up your transmitter to control a ship equipped with elevons only.

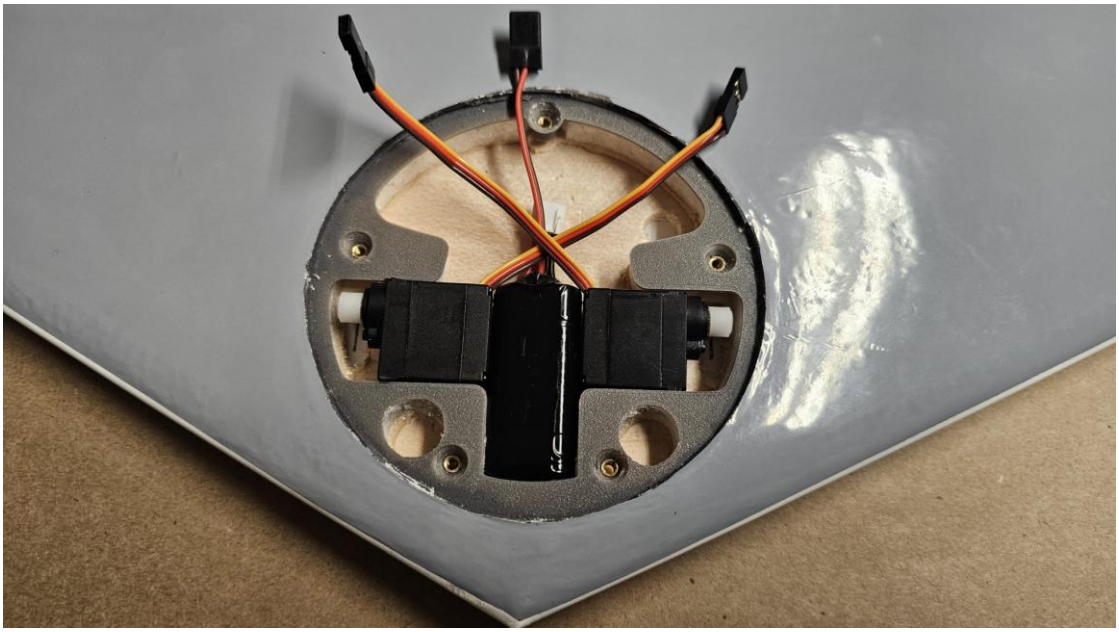
The "starting control throws" for the Wabbit are listed in page XX of this manual. You need not worry about the amount of throws just yet. Just so they move in the correct direction. You should set up at least a low and a high rate for both elevator and aileron functions.
Once the program is operating properly, center the elevator and ailerons trims on the transmitter and install the servo arms such that they are perpendicular to the large side of the servos when the sticks and trims in neutral.
After you are happy with the transmitter program and servo movements, set both elevator and aileron to low rates and power everything down.

Now it's time to install the electronics in the Wabbit
Start with installing the servos.
The servos will not fit unless you cut off the mounting lugs. Cut them off using a knife or saw. You will not need the lugs. The servos will be secured in place with glue (preferably hot-melt glue).

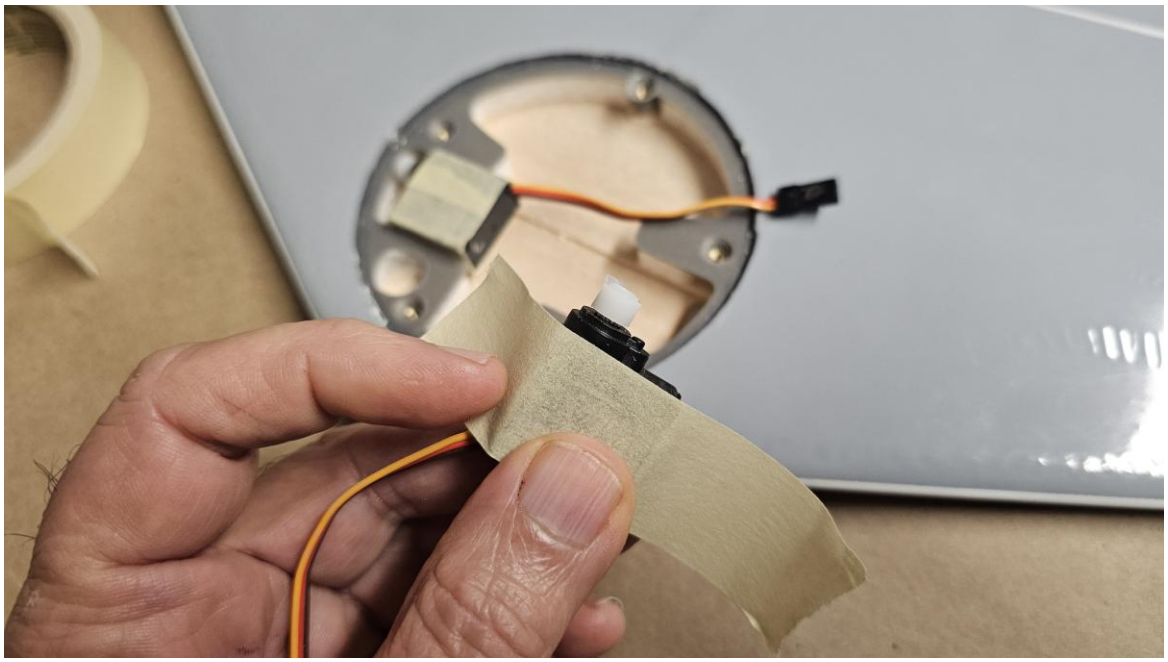
First trial-fit the servos in their respective slots:
a. In preparation, first remove the servo arms.

b. *Check the fit of the servos by inserting them in their slots so the shaft and arm are closer to the rear of the Wabbit. If installed the other way around, the arms might bind against their openings.*
c. *Draw a line in the middle of the arm openings on the white covering with a marker. Use this line as a guide and with a sharp knife cut a slit in the white covering for the servo arm to protrude through. A small slit large enough that would allow the arm to pass through is sufficient for now. Later you can make it longer, if needed.*

d. *Find a good spot for each servo, such that once installed, the servo arms will line up with the slit you cut in the previous step.*
e. *Make sure that with both servos fitted, there is enough space between them to fit the battery. Also make sure the spot you picked for the servos allows the servo wires to be routed to the receiver compartment.*
f.



g. *Remove the servos and install the servo arms back on them.*
h. *Wrap the servo cases in one layer of masking tape.*



i. *Place the servo back in its spot with the arm protruding through the slot you made in the covering. Check the top of the glider to make sure enough of the arm protrudes though, to allow the control rods to be installed without rubbing against the top surface of the wing. (the Z-bend in the provided control rod is to be connected to the servo arm). Some servo arms are longer than others! <u>If the servo arms are not long enough for the control rod to clear the top of the wing, use a Dremel tool and remove up to about 2mm of balsa surface where the servos will rest.</u> This will allow the servos to "sink-in" a little more.*
   DO NOT GLUE THE SERVOS IN PLACE YET.
   Use a couple of pieces of masking tape to pin the servos in place temporarily.
j. *Place the battery in its spot. There should be no need to glue it in place. A small slice of foam on top will secure it, by compression, once you install the front hatch.*

Next connect the servo wires to the receiver and fit the receiver in the rear compartment and make sure everything fits and you can close both hatches.

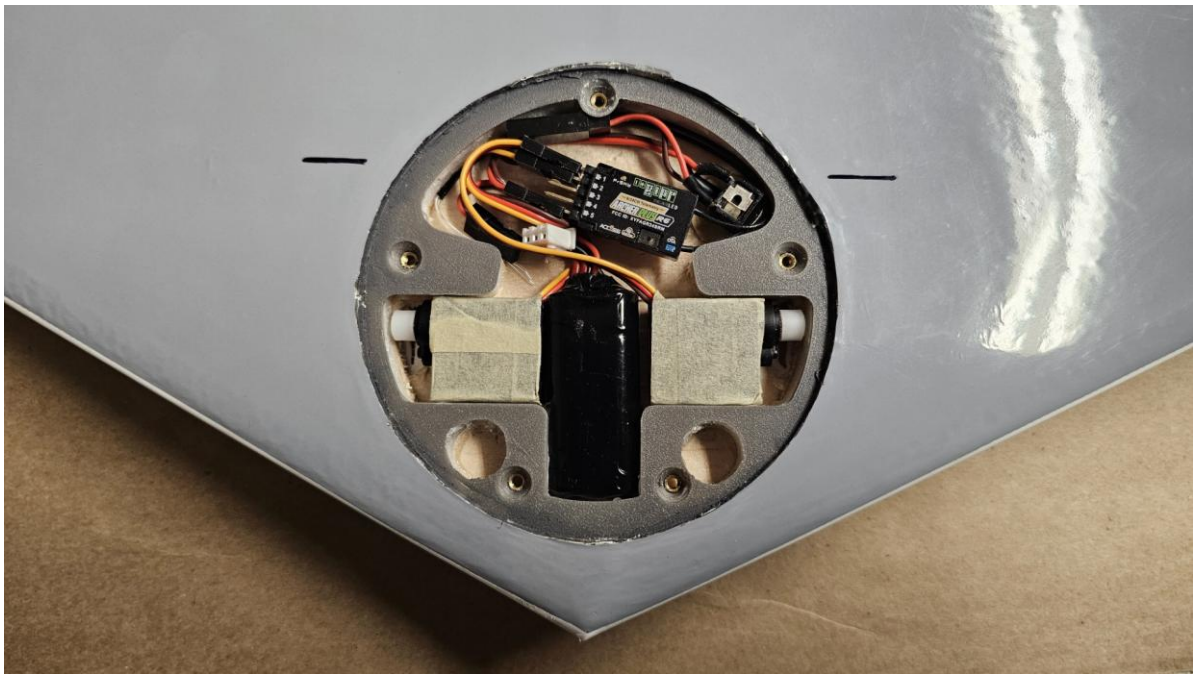
<u>Do not power the receiver yet.</u>

Power Switch

If you wish to install a switch, you can use the circular opening provided in the receiver compartment. A better option might be a Zepsus type magnetic switch.

Once you are happy with the fit of the electronics, test their operation.
Turn on the transmitter, center the trims and set the rates to "low".
Power the receiver by connecting it to the battery.
The servos should come to life, and if the transmitter is programmed correctly, the servo arms should be centered in the slot you cut and they should operate as required. As you move the transmitter stick, the servo arms will slide through the covering and open it up further if they need to.
Check to see if the servo arms hit the ends of the opening in the balsa lid.
If you need more travel for the servos and the arms are binding against the arm openings in the balsa lid, you can remove enough balsa from the ends of the openings to give you enough travel.

Once you have the servos moving in the correct direction and they are not binding, you are ready to secure them in place.
Unlike the battery, the servos need to be firmly secured, otherwise controlled flight will be hard to achieve.
Use the smallest amount of glue on the masking tape that the servos are wrapped in (hot-melt glue works best) to secure them to the balsa lid. (It is called a "lid" because it forms the top of the compartments!) Alternatively, you can use small dabs of glue on the corners of the servos or along their edges to make sure the servos won't move around and are firmly attached to the airframe.

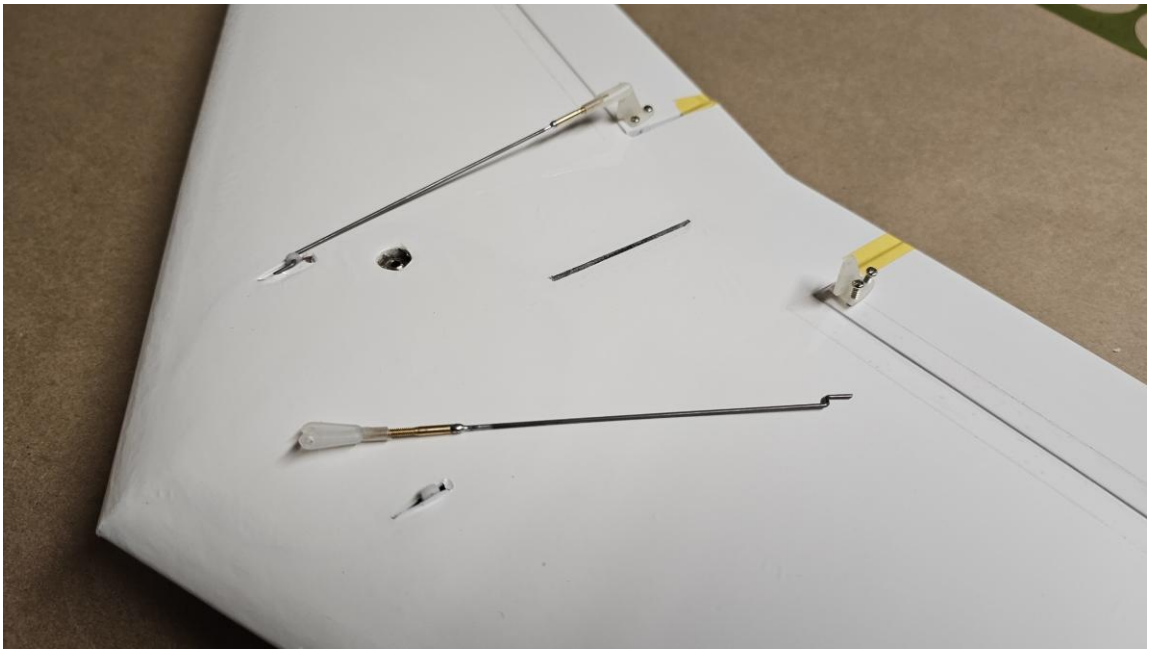


Once you have everything fitted, it's time to close the hatches so you can install the control rods and balance the Wabbit.

Install the front hatch first and secure it with the four screws. Next install the rear hatch by sliding its front edge under the back edge of the front hatch and securing it with the single screw.

A word of caution about the screws holding the hatches in place:
Always insert all screws in place before tightening them one by one.
If you tighten one screw and then try to install the others, you might find that they are hard to turn because the hatch was out-of-place when you started.
Also …. Be gentle! Do not press down hard when turning the screws….you can break free the threaded insert if not careful.

Installing the Elevon Horns and Control Rods:
Now that the servos have been installed and the transmitter program is properly controlling them, it's time to install the control horns and the control rods.



k. *Remove the control rods from the control horns.*
l. *Remove the screws holding the control horn backing plate in place.*
m. *Install the control horns on the elevons using the screws. The holes for the screws are already drilled for you. Give the horn a light tug after it is installed to make sure it will not come loose.*
n. *Insert the Z-bend end of the control rod in the servo arm hole furthest from the top surface of the wing.*
o. *Connect the control rod clevis to the elevon control horn.*
p. *Adjust the clevis so each elevon is level with the fixed center section of the wing trialing edge.*
q. *Turn the system on and check the elevons' operation. Make trim adjustments as necessary.*

Control Surface Travel:

Now is the time to dial in the starting control surface throws.
The recommended control surface travel distances are as follows:

	Low Rates	*High Rates*
Elevator travel:	*3/32" UP , 3/32" DOWN*	*3/16" UP , 3/16" DOWN*
Aileron travel:	*1/4" UP , 1/4" DOWN*	*1/2" UP , 1/2" DOWN*

You will adjust these rates as you become familiar with the Wabbit.
But to start, you shouldn't deviate from these figures too much.

To produce these rates, you have to use your transmitter programming and/or move the clevis to a different hole on the control horn.
It is, however, recommended that you leave exponential at zero for the first few flights.

As you will read in the next sections, as you move the CG back, you will need to reduce the elevator travel.

Installing the Fin:

The Fin is made of 1/16" balsa and covered with heat-shrink covering.
It is stiff, but over time it will inevitably get damaged. So before going forward, trace the outline of the Fin on a piece of paper and save it. It will come in handy when you eventually break the Fin and need to make another one yourself!

Insert the fin into the fin slot and push it down until fully seated. The fit can be tight here, so be gentle so as not to break the Fin.

Even if the Fin fits tightly, it is a good idea to secure it to the wing so that it cannot be knocked away in flight.

The best way to secure the Fin is to use two small pieces of tape, one on each side.

The best place to secure the Fin is near the trailing edge. At this spot the pieces of tape will hold the back end of the Fin securely and prevent it from flapping around.
It is much easier to fly the Wabbit with precision when the Fin is not flapping around!

Although you can glue the Fin in place permanently, you will lose the ability to transport your Wabbit effectively if you do so.

If you find that the fin has curved to one side (usually due to heat exposure) heat it slightly on the opposite side to straighten it. Place the fin on a flat surface with a

sheet of paper towel on top of it. Place a warm heat shrink iron or household iron on top of the paper towel for a few seconds then hold the fin to the surface after you remove the heat until it cools down. All you need is a little bit of heat …Don't over do it!

Balancing:

The Wabbit was fitted with a 13 gram nose weight during manufacturing.
This is the least amount of nose weight required to balance it for flight.
Most electronic installations will require more weight to be added near the nose to balance it as listed below:

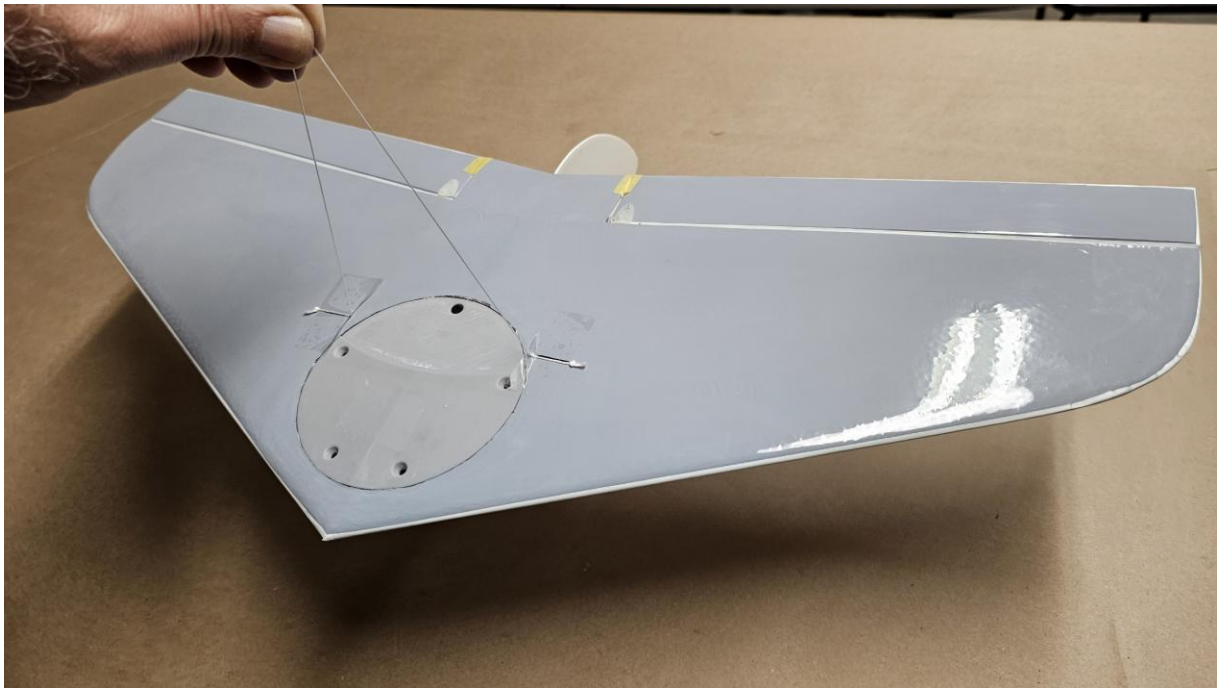
The starting balance point of the Wabbit is 4-1/8" (105 mm) behind the nose.

This balance point is marked for you on both sides of the hatch with two black lines.

You can use two sharp points to balance the plane on these marks with the plane in an upright position.

However, due to its small size, it is easier to use a piece of string to balance the Wabbit in the inverted position. To do so, follow these steps:

r. *Attach the ends of the string at the balance points with two pieces of tape.*
s. *Holding the string from the middle, lift the plane and see which way it tips.*
t. *If the glider tips toward the nose you will need more tail weight.*
   This is highly unlikely although not impossible!
u. *If the glider tips toward the tail you will need more nose weight.*
   This is very likely !



The Wabbit has two small circular internal cavities on either side of the battery compartment, where more balance weight can be added. These cavities measure 12 mm in diameter and 10mm deep each can accommodate about 14 grams of lead for a total of 28 grams.

v. *Add enough weights in the internal cavities until the plane stays horizontal.*

w. *If your electronics installation requires more weight than would fit in the internal cavities, you have a few options:*

    1. *Fit a small nose-weight in front of the battery. This will push the battery back and into the receiver compartment a bit, but it should not be a problem if you are using a small enough receiver.*
    2. *You can tape a thin sheet of lead under the nose.*
    (the original Wabbit prototype flew with a similar nose weight for years!)

Now that your Wabbit is balanced at the so-called hash marks, we will call this balance point the Center of Gravity (CG).

Most Wabbits will fly straight and level with neutral control surfaces and the starting ***CG set at 4-1/8" (105 mm)****. This, however, is not guaranteed!*
Be prepared to make adjustments to the CG and/or the control surfaces if the plane does not behave as expected.

"Making Adjustments" involves moving the CG forward or aft and/ or changing the neutral point of the control surfaces and/or changing the control surface travel distances and the amount of elevator reflex, and/or a combination of all of these.

This is not really a difficult task as long as you have "patience", are able to "observe" the planes behavior and know how to "respond" accordingly as you will read about later.

Keep adding and removing small external weights until you arrive at a CG that you are happy with.
At that point you can find out where the CG has moved to by finding the spot where the Wabbit will hang in a level attitude from the balancing strings.
You can then move the external weights inside and position them in a manner that they will cause the system will balance at the desired spot.

Flying! :

The Wabbit should now be charged, shop CG'd, travel adjusted and the elevons should be neutral. Make sure that you have set up dual rates for the elevator throw, just in case.

For the maiden flight, set the elevator control to low rates and trim the elevator up just a bit (no more than 1/16" of up-elevator) also just in case.

The best way to launch the Wabbit is to use a flat-palm throw otherwise known as a "pizza toss". Wait for good lift and give it a straight, firm, and level launch, with a good follow through…not too wimpy, not too hard… more like a javelin toss than a baseball pitch. Fly conservatively and make shallow turn , until you become used to the controls, then trim the Wabbit as best you can for straight and level flight. To improve the flight performance, follow the "Fine Tuning" steps below.

Fine Tuning:

The goal of fine-tuning is to find the optimal CG location and the corresponding elevator reflex/trim/travel that would allow the Wabbit to fly faster and "bang" turns better.

A plane that is not fine-tuned will exhibit one or many of the following behaviors:

1. *Rapid up and down bobbing of the nose known as "hyperstalling"*
   This is caused by the plane being extremely "nose heavy" with excessive elevator travel.

2. *Extreme altitude gain with increased airspeed.*
   This is caused by the plane being moderately "nose heavy".

3. *Extreme altitude loss with increased airspeed.*
   This is caused by the plane being moderately "tail heavy".

4. *Sluggish flight.*
   This is usually caused by the plane being moderately "nose heavy" or when the" airframe is aerodynamically un-clean and so called "draggy"!

.

5. *Slow turns.*
   This is usually caused by the plane being moderately "nose heavy"

6. *Extreme altitude loss while inverted*
   This is usually caused by the plane being moderately "nose heavy"

7. *Lack of positive control*
   This is usually caused by the plane being extremely "tail heavy"

To correct these behaviors, it is best to make one adjustment at a time and observe the effects of that adjustment in flight before making another adjustment. This can be time consuming but it isn't really difficult.

In most cases the plane is nose-heavy and the CG needs to be moved back. Remember that when you move the CG back you also need to reduce the reflex (the amount of elevator up-trim) and the amount of elevator travel (reduced elevator rate). If you don't, the aircraft will become increasingly sensitive to elevator control and ultimately uncontrollable.

To start moving the CG back:
Place a small supplemental sticky weight on the CG and begin moving it back with successive flights until the plane feels smooth yet very peppy on the turns and energetic in the vertical pumps. Make very small movements with the weight, about 1/2" at a time. Properly CG'd, the Wabbit will be fast, stable, maintain energy extremely well in both medium and heavy lift, fly effortlessly inverted, snap turns, and have great spiral and yaw stability. If it doesn't have ALL of these properties, it is likely due to one or two things:

(a) Your CG is not yet perfect.
(b) You have too much elevator throw. In our experience, it is usually both.

Keep the Wabbit in good shape:

The best way to clean the Wabbit is to wipe it down with glass cleaner.
To remove tougher stains you can use acetone as long as you don't let it seep into the electronics.

Do not leave your Wabbit in a hot car! The wing is stiff but it will develop a warp if exposed to extreme heat.

To check for a warp, sight the Wabbit from behind. If the trailing edge is not centered on the silhouette of the top and bottom of the wing, it is warped.
To remove a warp, gently twist the wing in the opposite direction and use heat to remove the wrinkles that develop in the covering.

When using an iron to remove wrinkles, do not press the iron down. Hover it over the area until the wrinkles disappear. Don not touch the area until it has cooled down.

HAPPY FLIGHTS & THANKS FOR CHOOSING THE WABBIT

NCFM 2025 Wabbit
Electronics Compartment:

Servos:

Available space : Height: 34 mm (top of arm to bottom of servo)
Width: 23.5 mm (no mounting lugs)
Thickness: 14 mm

Prototype servos: 2x Corona DS939HV (34mm x 23mm x 11.87mm)

Note: Corona DS929HV servos are similar in size but slightly faster with a bit less torque.
The speed increase is not very significant, but it doesn't hurt.

Battery:

Available space : Length: 43 mm
Width: 20 mm
Thickness: 14 mm

Prototype battery: Tattu 2S HV 300mAh (45 mm x 16mm x 12 mm)

Note: Use of Lipo and other soft-case battery packs for slope soaring is not recommended due to the risk of fire.
A better choice is hard-case Li-Ion AAA batteries. A 2-cell pack will fit in the available space.

Receiver :

Available space : Length: 42 mm (*)
Width: 26 mm
Thickness: 14 mm

Prototype Receiver: FrSky Archer Plus R6 (33 mm x 15 mm x 10 mm – exclusive of the connectors)

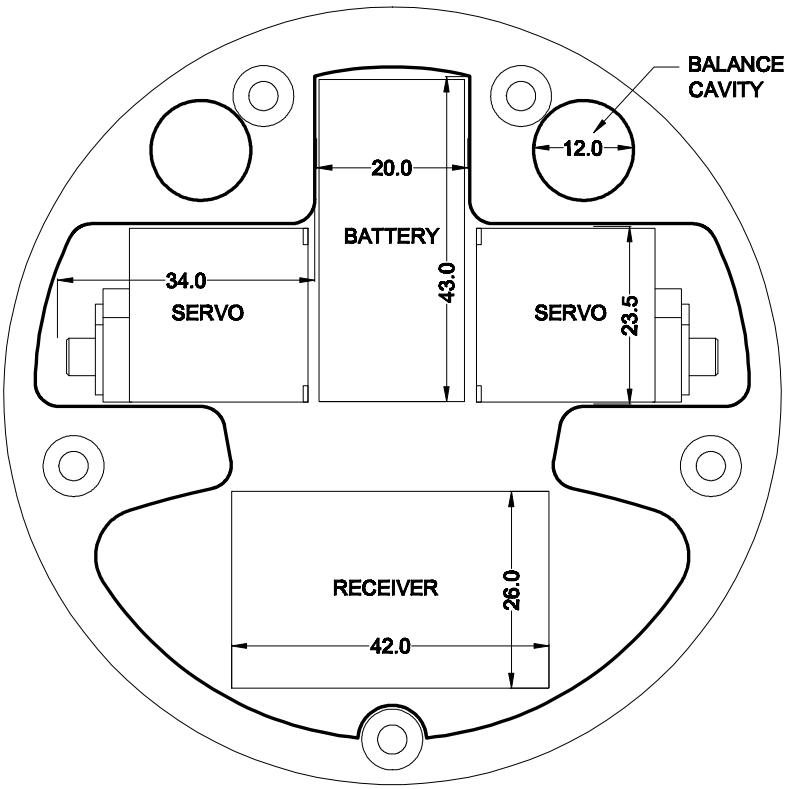
Note: The available space for the Rx is not rectangular. Consequently a narrower Rx can afford to be longer.
Conversely a wider Rx needs to be shorter. Consider using the smallest Rx available to you.
(*) Due to the shape of the Rx compartment, location of Rx connector pins must be considered.
Consult the full-scale Compartment Layout provided when planning your electronics choices.
A battery switch, installed in the provided opening, will reduce the available space for the Rx.

Balance:

Available space : Diameter: 12 mm
Height: 10 mm

Note: Two cavities are provided for weights that might be needed to balance the Wabbit.
If electronics similar to the ones used in the prototype are installed, the two cavities will be sufficient for internally balancing the Wabbit with weights of similar density to lead.
The additional weight of heavier electronics, especially a heavier Rx and/or attendant wiring, might require external balance weight. This could be accommodated by the installation of a thin sheet of lead under the nose.

Additional Notes: In planning the electronics it helps to be mindful of the usual space required for stowing the battery and servo wires and connectors. These will be stowed mostly in the Rx compartment and in the void spaces around it. A smaller Rx will make stowing these wires a lot less challenging.



NCFM 2025 WABBIT

ELECTRONICS COMPARTMENT

FULL SCALE