



Stable Flyer VI - Small Toy Glider



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[VIEW IN BROWSER](#)

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Summary

One piece ready to fly toy glider. Throw it like a dart and watch it glide. Now with LIGHT version!

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NOTE:

After reading [this paper](#) on the effect of Tail Dihedral on stability, and experimenting on my design, it seems that it is a great idea to angle the Horizontal Stabilizer into a negative dihedral (anhedral). **Or in other words, for even smoother flying, slightly bend the horizontal stabilizer into an inverted V.**

Intro

Inspired by other single piece gliders like [Stratos Glider](#) and [Bukobot Fly](#).

This is a one piece ready-to-fly toy glider. Made to be thrown by hand, like a dart.

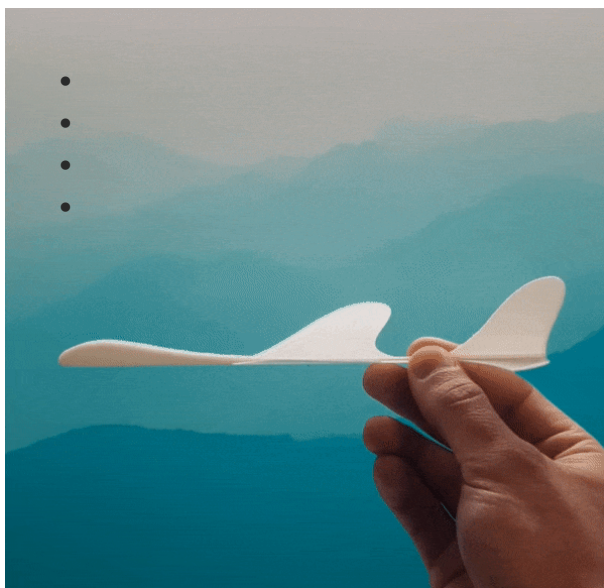
Now with an adjustable elevator, allowing easier trimming for a perfect glide ratio.

You can also check the remix from JoeRixon [here](#).

Stable Flyer VI LIGHT

After taking into consideration some very valuable suggestions from Stuclick over in the comments, I've designed a lighter version with a detachable vertical stabilizer.

Perfect for throwing indoors, since with a weight of only 6g in PLA it has a very low impact energy, making sure no TVs or portraits get broken.



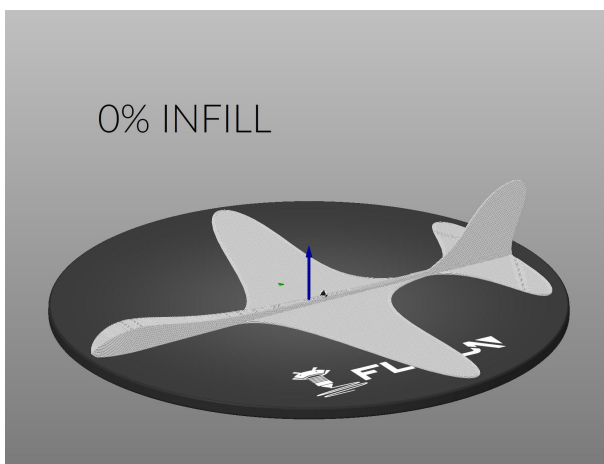
Steps to Fly

Print with the desired infill.
Bend its wings slightly up.
Adjust the elevator at the tail
Hold it between the wing and the tail and throw it!

Infill

The infill will affect the weight of the glider's nose. **15% provides the closest to neutral stability with PLA.**

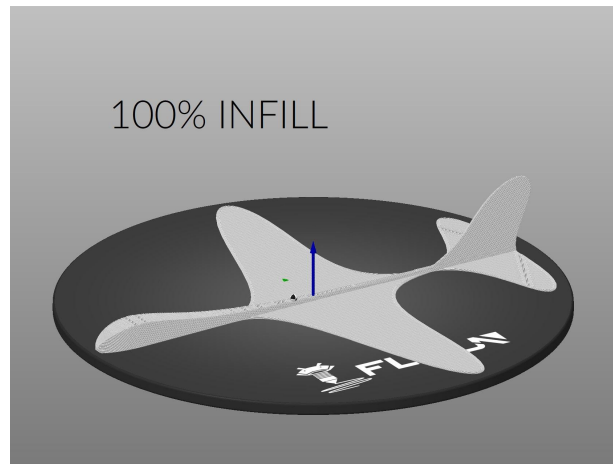
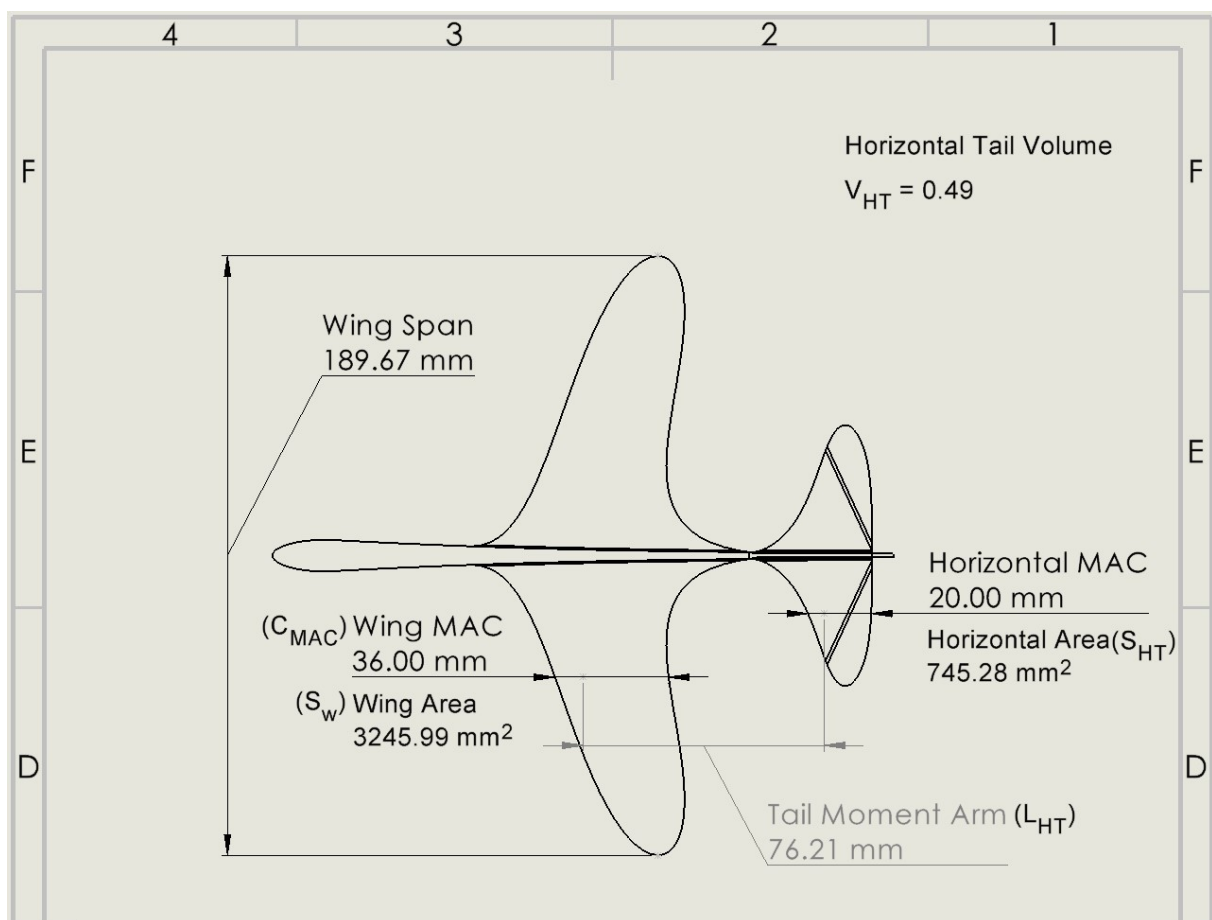
The difference between 0% Infill and 100% Infill can be seen in the shift of the position of the Center of Gravity.



This, in turn, affects the flight characteristics of the glider.

As a fun experiment, try to print it with 10% Infill and 100% Infill, then throw both and try to understand how the shift in the C.G affects the way it glides.

ONLY SCROLL DOWN IF YOU ARE BORED AND CURIOUS. Aircraft Design - Tail Sizing



In order for an aircraft to be stable, there has to be a precise relation between the size of its wing and the size of its empennage (vertical and horizontal stabilizers AKA Tail).

By measuring the different dimensions in the image above we are able to calculate a coefficient called the **Horizontal Tail Volume**.

$$V_{HT} = \frac{L_{HT} S_{HT}}{C_{MAC} S_W}$$

This coefficient translates the relation between the size of the Wing and the size of the Horizontal Stabilizer, which plays a crucial role in defining the stability of the aircraft. Too big and the aircraft will be tail-heavy and slow, while too small and it will not be enough to maintain the desired attitude.

The value of the coefficient should then be compared against a reference table in order to understand whether it's within the correct margin.

Table 6.4 Tail volume coefficient

	Typical values	
	Horizontal c_{HT}	Vertical c_{VT}
Sailplane	0.50	0.02
Homebuilt	0.50	0.04
General aviation—single engine	0.70	0.04
General aviation—twin engine	0.80	0.07
Agricultural	0.50	0.04
Twin turboprop	0.90	0.08
Flying boat	0.70	0.06
Jet trainer	0.70	0.06
Jet fighter	0.40	0.07
Military cargo/bomber	1.00	0.08
Jet transport	1.00	0.09

Raymer, D., Aircraft Design: A Conceptual Approach

The value for the **Vertical Tail Volume** can also be calculated using a similar logic. Which I will describe here in the future.

Changelog

Gen.III

- First Publish.

Gen.IV

- Added elevator notch for easier trimming.
- Decreased wing sweep for better glide ratio.

Gen.V

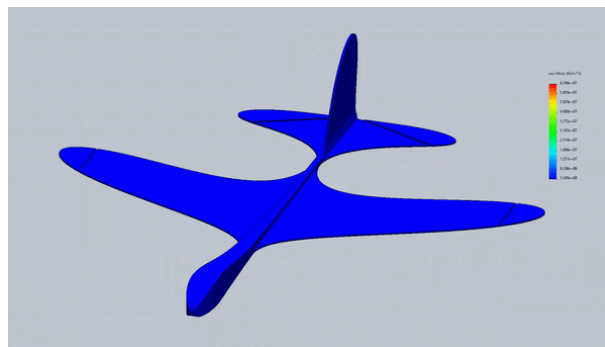
- Slightly increased Wing Area for better glide ratio.
- Slightly increased Sweep for more directional stability.

Gen.VI

- Increased Vertical Stabilizer area for more directional stability.
- Increased Wing Sweep to 25° for more directional stability.

Gen.VI - Reinforced

- Thicker Rudder, from 0.8mm to 1mm.
- Thicker Tailboom, now ends with a width of 3mm.



Gen.VI - Light

- Thinner lifting surfaces. 0.8mm to 0.4mm
- Slimmer nose for weight reduction.
- Detachable vertical stabilizer to allow for better print orientation (Flat on bed).

Model files



CAD

2 files



stableflyer-genvi.step



stableflyer-genvi.sldprt

☐ SOLIDWORKS 2021



Archive

4 files



stable_flyer_-_genv.stl



stable_flyer_-_geniv.stl



stable_flyer_-_geniii.stl



stableflyer-genvi-reinforced.stl

☐ Perfect for LW-PLA or a stronger PLA/PETG print.



stableflyer-genvi.stl



stableflyer-genvi-light.stl

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