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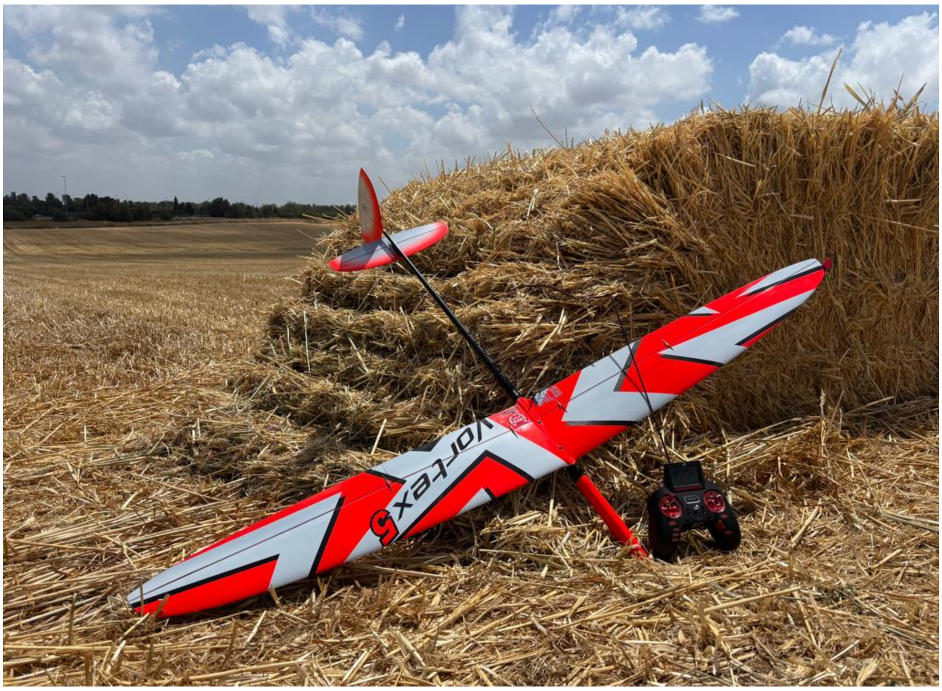
VORTEX 5 by DS-Composites



Well… the cat is finally out of the bag… for the last year the Vortex team has been designing a brand-new model, a model that takes several design concepts to the extreme, the Vortex 5!

Design history – the VORTEX family

We entered the design process after over a decade of success with the Vortex family and asked ourselves where do we want to improve from here? How do we push the performance envelope even further? And, what design characteristics are required to be even more competitive then we are today?

We also asked ourselves, what made our previous designs successful and how did our model characteristics evolve over the years?

Over the design history of the Vortex family our models started with a floaty Vortex 1, progressed to a quicker and nimbler Vortex 2 which sometimes proved a bit challenging to fly, especially the 2.5.

Later came the Vortex 3, which was a well-rounded model with good float and excellent handling when flown in the wind, but requiring being flown a bit heavier than we liked.

The Vortex 4 corrected this with it's excellent penetration, becoming one of the very best models in the wind, a trait that has made it very successful and loved by many pilots. However, the Vortex 4 turned out to be a bit more of a handful to fly than the Vortex 3 and needs to be light (215-225) for good float performance.

Design goals

For the Vortex 5 we had several goals, we wanted to reduce the dependency on low weight found in the V4 in order to get good floating capability. Being able to capitalize on the floating abilities of a model without requiring a lighter version for calm days, allows for a more versatile airframe and makes for a better overall model in both competition and sport flying. For super light conditions and dead air, it is still best to have a dedicated light version but we wanted our design not to pay too much in light air performance relative to the tradeoff we have in the Vortex 4.

We also wanted to make a considerable improvement to penetration in the wind. We realized that most points in competitive flying are won or lost in the wind. The ability to fly a glider with less ballast in the wind allows pilots to throw at lower overall weights, as throwing very heavy models is difficult for many pilots and ends up impacting their launch altitude. A heavily ballasted model also tends not to climb as fast in the thermal, a feature that is very important in the wind, is a fast climb that allows gaining much needed potential to come back from far away.

Another main goal was launch height. Float and penetration are great but starting the flight a few good meters higher opens up many options and improves overall performance. No DLG pilot will never say no to more launch height…

The last goal we had was to improve handling characteristics in order to make it easier to fly than the V4. We decided to investigate how to improve handling using our previous designs as test beds and to better understand why some handling characteristics are harder to anticipate when designing a new model. We had a good understanding of some of the issues through the differences between the V2, V2.5 and V3, with all having had both top and bottom tail configurations and different tails and tail airfoils.

The Aero design

Great effort was made to reduce the drag of the airframe as it improves all three of the above goals. We decided to push the limits this time with more complicated molds in order to reduce interface drag between the fuselage and aero surfaces, focusing mainly on the fuselage to wing and rudder to fuselage interface drag (elevator was also addressed but with no major changes relative to V3 and V4). We reduced the fuselage size to the bare minimum, designing around the new 6 gram servos which have proved themselves and greatly improved over the last 4 years. We also removed the auto mating control system of the V3 in order to reduce the required volume in the fuselage and reduced the fuselage volume under the wing to the minimum required for the ballast system and for fuselage stiffness.

The wing was redesigned to take an additional step beyond the V4, pushing thickness as low as possible with current servos and materials. The flaps and ailerons are even thinner than the V4. At the root, a servo of 8 mm in thickness is the maximum possible for a 2 servo wing configuration (flapperons). For a 4 servo wing (flaps and ailerons) a 7 mm thick servo is the maximum possible at the ailerons. Total wing area was reduced compared to the V4, to 19.1 dm. Lower wing areas were also considered but the penalty to performance was deemed not to be worth it. New airfoils for the wing were designed, based on the V4 airfoils and greatly improved for required performance.

A new rudder airfoil and planform were designed, and old design concepts were given a new approach in order to improve launch and reduce weight.

Handling and Stability

For several months we conducted a study on the V3 and V4. We played with settings, different elevators (smaller, different aspect ratios) and finally elevator positions relative to the wing (top, bottom and different heights). After multiple tests and with the help of team members all around the world giving their input, we had a much better understanding of the impacts of tail design on the overall behavior and stability of the model. We took all these inputs and developed a tool to help us anticipate the flow interference on the elevator and design the fuselage and tails to avoid harmful interference between the wing and the elevator.

We also decided to increase the dihedral angle very slightly compared to the V4 to 6.75 degrees to improve stability and ease of flying in faraway thermals.

Construction and other features

Construction was also taken a step forward, a smaller diameter fuselage creates new challenges in strength and stiffness and therefore a detailed and thought-out design of the fuselage was needed in order to avoid weak points at the leading and trailing edges of the wings, where most failures occur. The wing flaps and ailerons were strengthened in torsion to allow for the thin structure not to flutter in 80+ meter launches and the 2 piece wing system was improved to be even stronger and lighter compared to the V4.

The rudder was designed to be removable with a hexagon conical boom connector. Fixing the rudder in place is done with a piece of clear tape.

The elevator and elevator post have a built in shaped feature to prevent trim changes when disassembling and reassembling the elevator, making it more suitable for transport in travel cases.

The ballast system has changed to allow for a more secure way of installing the ballast in the model.

The servos are mounted inverted in order to allow for the pull stings to be as straight as possible therefore reducing the flexing of the wires so to reduce this from affecting trim.

The Vortex 5 will be available in both 4 and 6 servo versions. Our positive experience with the V4 has shown that it's a matter of personal preference but 4 servo versions tend to benefit from the reduced weight while 6 servo versions are easier and slightly more efficient in windy conditions where they usually tend to climb better and are a bit easier to fly well.

For orders please contact: Vortex.dlg@gmail.com