Report: FW40

Characteristics

Wing: rectangular 5.25”x40” 19mm (2-spacer) airfoil with dihedral ~4°

Fuselage: 30” foam tube, approx. 55mm square

Propulsion: FT 2212 1300kV brushless DC motor

Battery: 1000mAh 25C 3S (nominal max 11.7Vx25A = 292 W)

Weight: ~550g flight

Issues Identified

ISSUE AND DESCRIPTION	REMEDY
Plane is overweight: requires very high flight speed to generate lift	Use smaller fuselage of 20” instead of 30”, eliminate excess wire length, and scale down other components. Taper fuselage to shave off some more weight.
Fuselage is not aerodynamic: flat face at front and rear	No simple remedy for front. For rear, have tail taper for about 10”. Tapering bottom up is very simple but does not add yaw stability and may add a lifting body effect downwards. Tapering sides to center requires more planning but adds yaw stability and can be combined with upwards taper.
Elevator and rudder servos are in exposed position, creating drag and spoiling airflow to tail surfaces	Embed servos into fuselage, with only the top and servo arm exposed. Connect to tail with long (30cm?) pushrod. Aerodynamic impact of pushrod is small, and weight is offset by eliminating servo wire connecter due to servo placement closer to receiver. Install the pushrod first, then cut a hole in the top of the fuselage and hot glue servo to sidewall.
Plane is captured by the wind: has a very strong tendency to turn with the wind, making directional control almost impossible in high wind	Use smaller fuselage, and cut down control surface size, especially vertical stabilizer. Plane is probably overly stable anyways.
Motor comes loose from firewall on hard landings; wood screws tear from wood	Alter firewall mounting method: mount motor with screws in pre-drilled holes, held by nuts, and use washers to distribute loads around screws. For FT 2212 with single-layer firewall (3mm), 3/8” length screw is sufficient. For double-layer firewall (6mm), at least ½”, preferably 5/8” for margin of safety. Same applies for 2205. I am

	currently using #4-40 machine screws in a 5/32” hole.
Installing pushrods is very difficult: current tools cannot cut pushrods without fatiguing the metal, 1.2mm pushrods requires expansion of servo arm holes.	For elevator/rudder servos: use full pushrod length to avoid need for cutting. For aileron servos: use 19-20 guage galvanized steel wire (or 0.9mm-1mm piano wire). Double wire and wrap in heat shrink if extra stiffness is needed. This is easy to cut to the correct length and requires no (or very little) expansion of servo arm holes.
Plane cannot land	Use 2mm coat hanger wire to mount landing gear; use zipties and popsicle sticks/bamboo skewers to secure to fuselage. See FliteTest video https://youtu.be/po2P1X2OsGA for simplest arrangement. If needed, buy 2mm galvanized steel wire from RONA.