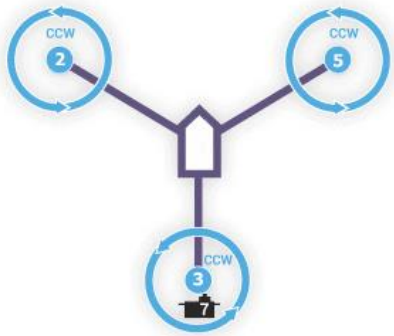
TEAM

VERSA - TOL

Design Proposal

September 23rd, 2015

Agenda



- Weight
- Thrust / Efficiency
- Lift/Drag
- Mechatronics
- Miscellaneous Details

Comparison

Weight

Component	Old Design	New Design
Weight of Plane	5,488 g	2,000g
Weight of V-Tol Component	2,750 g	2,500g
Sensor Payload	Unknown	500g
All up weight	8,238g	5,500g
Weight per motor	2,059g	1,830g

Comparison

Thrust

Component	Old Design	New Design
Desired Thrust (n = 2)	4,118g	3,660g
Number of motors	4	3
Size of Props	18.5x5.5	16x5.5

Prop Manf.	Prop Size	Li-Po Cells	Input Voltage	Motor Amps	Input Watts	Prop RPM	Pitch Speed in MPH	Thrust Grams	Thrust Ounces	Thrust Eff. Grams/W
APC	14x5.5-MR	6	22.2	21.50	477.3	7,525	39.2	2788	98.34	5.84
APC	16x5.5-MR	6	22.2	31.29	694.6	6,915	36.0	3749	132.24	5.40
APC	18x5.5-MR	6	22.2	38.76	860.5	6,414	33.4	4468	157.60	5.19
GemFan	15x4.5-MR	6	22.2	19.73	438.0	7,638	32.5	2661	93.86	6.08
GemFan	16x4.5-MR	6	22.2	25.37	563.2	7,276	31.0	3220	113.58	5.72
RC-Timer	12x5.5-CF	6	22.2	16.44	365.0	7,874	41.0	1911	67.41	5.24
RC-Timer	13x5.5-CF	6	22.2	21.90	486.2	7,495	39.0	2417	85.26	4.97
RC-Timer	14x5.5-CF	6	22.2	29.31	650.7	7,021	36.6	2855	100.71	4.39
RC-Timer	15x5.5-CF	6	22.2	39.95	886.9	6,352	33.1	3375	119.05	3.81

Propeller Chart Color Code Explanation

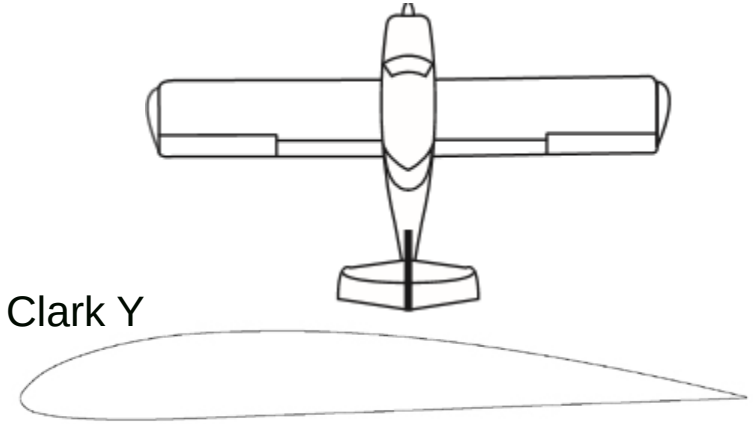
The prop is sized right to get good power from the motor. (50 to 80% power)

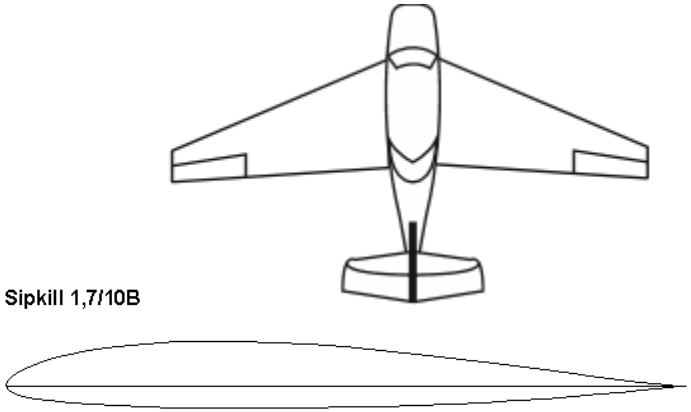
The prop can be used, but full throttle should be kept to short bursts. (80 to 100% power)

Comparison

Lift/Drag Characteristics

Component	Old Design	New Design
Airfoil	Clark Y	Sipkill
Wing Shape	Rectangular	Slightly Swept
Surface Area	0.396	0.209
Mean Chord	0.360	0.310
Aspect Ratio	0.909	1.480





Comparison

Mechatronics

Component	Old Design	New Design
Flight Controller	APM 2.6	Pixhawk
Firmware (VTOL)	Unsupported	Open Development
Flight Surfaces	3	1
Servos Required	8	5
Control Parameters (Vertical/Horizontal)	4/4	4/2

Old Design

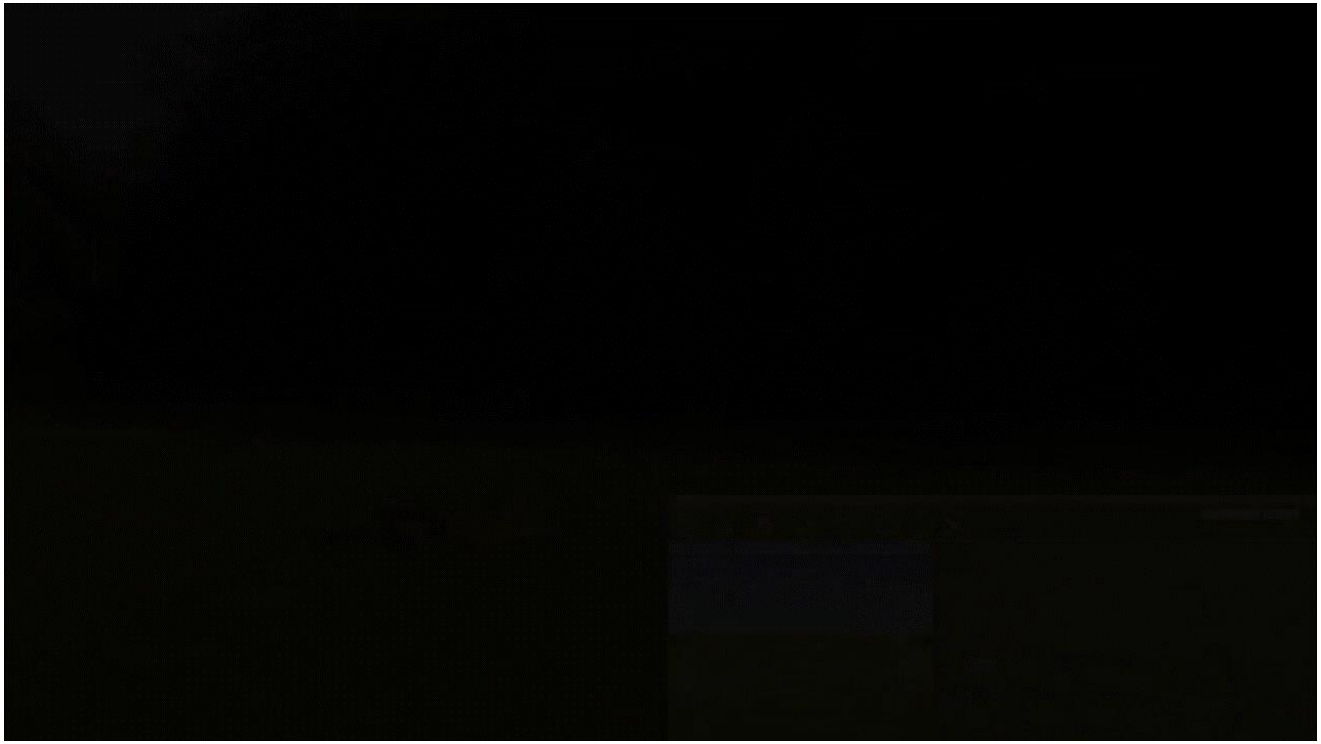
miscellaneous details

- Difficult to Repair & Modify
- No sensor package
- Over complicated / Excessive material

Old Design

miscellaneous details

- Unstable motor mounts
- Unstable vehicle integrations
- Center of Gravity not Utilized



Proposed Design

miscellaneous details

- Durable & impact resistant material
- Easily replaceable part
- Better flight time (65% increase)

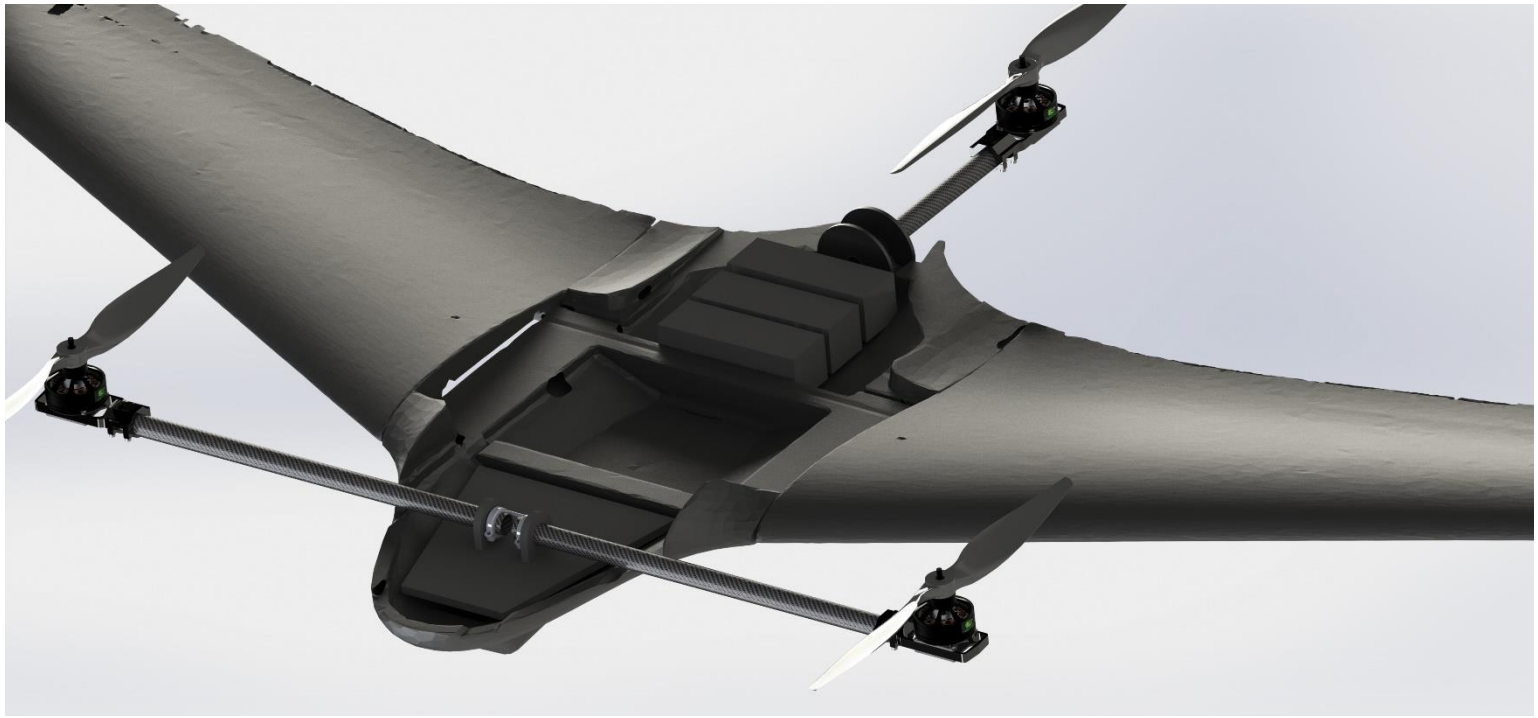
Component	Old Design	New Design
Amp Draw (100%)	38.76	31.29
Number of Motors	4	3
Total Amp Draw	155.04	93.87
Flight Time	3.87	6.39

** Based on 100% thrust, 22.2 volt system, and 10,000 mAh battery

Proposed Design

miscellaneous details

- Designed around Center of Gravity
- Better Fuselage Capacity



Proposed Design

Concept Rendering

Thank you